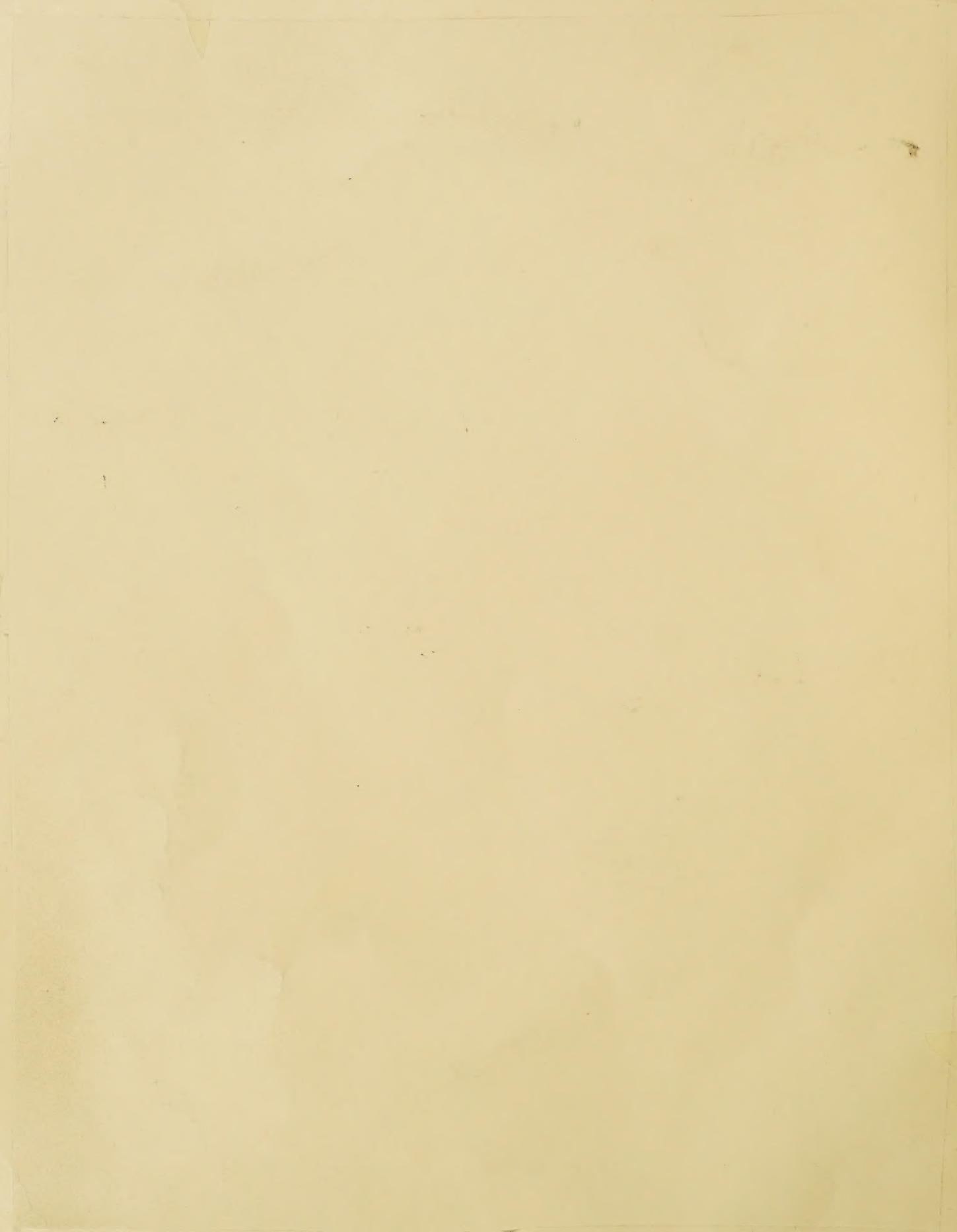


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Northeast Region

SARE



1998 Progress Report

Northeast Region
Sustainable Agriculture
Research & Education Program

**United States
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Agriculture**



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SARE & ACE: An Overview

The USDA-Sustainable Agriculture Research and Education (SARE) Program is a federal competitive grants program with regional leadership and decision making. SARE's mission is to increase knowledge that helps farmers adopt production and marketing practices that are profitable, environmentally sound and beneficial to local communities and society in general.

To accomplish these goals, the program places special emphasis on whole-farm systems research, including the profitability of alternative production and marketing methods. The program also funds experimental component research, exploratory research, demonstrations, educational projects, and in-service or professional development projects. SARE provides funding for projects carried out by scientists, producers, educators and private sector representatives.

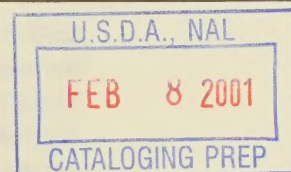
Authorized by the 1985 and 1990 Farm Bills, SARE was first funded in 1988. Over the decade, \$80.6 million funneled to SARE has supported nearly 1,200 projects.

SARE is administered through the USDA Cooperative Research, Education and Extension Service. Nationally, the 1998 allocation is approximately \$11.3 million.

Agriculture in Concert with the Environment (ACE) is a joint EPA-SARE program. Launched in 1991, it focuses on protecting environmentally sensitive areas, preventing agricultural pollution, and reducing the misuse of pesticides and other agricultural chemicals.

The Northeast region includes Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia and Washington, D.C.

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SARE places special emphasis on whole-farm, systems research, including profitability of alternative production and marketing methods.

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Credits

Cover Art	Cover Design
Bonnie Acker	Casey Chapple
Project Summaries	Typsetting
SARE Project Coordinators	Beth Holtzman, Jodi Condon
Farmer Grant Report Summaries	Copy Editing
Beth Holtzman	Elizabeth Seyler, Michael Levine
Jim Gardiner	Beth Holtzman

SARE project reports were written by the project investigators. Any opinions, findings, conclusions or recommendations expressed herein do not necessarily reflect the views of the USDA or the Northeast Region SARE Program.

Northeast Region SARE Mission

Editor's note: In July 1997, the Northeast Region Administrative Council adopted the following mission.

Our mission is to help develop and maintain diversified agricultural and forestry systems that enhance the economic, environmental and social health of the Northeast for present and future generations. Our work will support production, processing and marketing systems that sustain rural communities and support agricultural activities in the region's rural, urban and suburban areas.

Sustainable agricultural and forestry systems will:

- promote good stewardship of the land by utilizing production techniques and land management practices that prevent erosion, improve soil health and minimize water and air pollution;
- promote nutrient cycling through profitable use of agricultural byproducts and wastes;
- rely on — and encourage — greater diversity among farms, and on individual farms, as well as more management-intensive practices that are safe and environmentally sound;
- profitably employ more people in agricultural enterprises, both in full- and part-time capacities; and
- contribute to the quality of life for producers, communities and society as a whole.

Our research, education and on-farm demonstration efforts will:

- advance knowledge about and dissemination of conceptual, practical and scientific information needed by producers, marketers, farm advisors, processors and planners to adopt more sustainable practices;
- encourage farm and non-farm citizens in a process of discovery and learning that will support a more sustainable agricultural system;
- foster greater cooperation among farmers and new and strengthened partnerships between farmers, consumers, environmentalists, scientists, educators, government and agribusinesses;
- encourage an infrastructure for food processing and distribution that focuses on regional markets, strategically uses national and global markets, and enables producers to receive economic benefits from "value-added" products; and
- improve public understanding of the region's agriculture base, farming, farm products and policies and programs that are conducive to sustainable agricultural systems.

**Our work will support
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processing and
marketing systems
that sustain rural
communities, and
support agricultural
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region's rural, urban
and suburban areas.**

About This Report

This progress report provides summaries of active projects in 1997 — those that provided SARE with an annual or final report — or were selected for funding in 1997. Each summary outlines the major objectives, results and potential benefits of the project. These progress reports were written by the project investigators and submitted to the Northeast SARE in late 1997. Additional copies of these summaries are available individually, as are the full reports provided by the investigators. Contact us at the address on the back cover.

Additionally, this report provides information about the SARE program, its committees, mission and staff. We have also provided a resource list of regional and national SARE informational products — bulletins, books, videos, software, etc. — developed through SARE-supported initiatives.

How to Use this Report

While many SARE projects are multi-dimensional and can be listed under several different categories, we have organized the summaries as they fit best in 10 major categories:

- agronomic systems,
- dairy/livestock systems,
- education,
- fruit systems,
- ornamentals,
- marketing,
- urban-farm connections,
- professional development,
- vegetable systems, and
- farmer projects.

The category is listed at the top of the right hand column of each summary. Within these categories, the projects are generally organized chronologically, so that summaries of older projects appear in the front of each section.

Key Terms

Final Report—Results of a completed project.

Annual Report—Accomplishments during the most recent calendar year.

New Project Description—Plan of work for a newly funded project.

Collaborators—Major participants receiving SARE funding and/or providing matching contributions.

Maps

Many Northeast SARE projects are multi-state efforts. Each project report includes a map showing in shaded areas the states in which collaborators are located. Many projects are relevant to and conduct outreach activities in a broader portion of the region than is shown in the map.

Some important acronyms

ACE—Joint USDA-EPA Agriculture in Concert with the Environment Program.

ANE—used in project numbers, it denotes Northeast ACE-funded **research and education** projects.

ARS—USDA Agricultural Research Service.

ENE—used in project numbers, it denotes Northeast SARE **PDP** projects.

EPA—US Environmental Protection Agency

FNE—used in project numbers, it denotes Northeast SARE **farmer** grant projects.

LNE—used in project numbers, this denotes Northeast SARE **research and education** projects.

NRCS—USDA Natural Resources Conservation Service.

PDP—SARE Professional Development Program.

SAN—Sustainable Agriculture Network, SARE's outreach arm.

USDA—US Department of Agriculture.

Progress over a Decade: 1997 Grant Awards

In its 10th year, the Northeast Region SARE program awarded \$2.15 million in grants to projects that will advance practical, profitable and environmentally sound farming practices. “Taken as a whole, these projects show how the SARE program has matured over 10 years” says Northeast Region SARE Coordinator Fred Magdoff.

In SARE’s early years, Magdoff explains, the majority of projects focused on developing production systems aimed at reducing purchased inputs and environmental impacts.

More recently, however, SARE has cast its vision well beyond the farm gate, funding projects that focus on processing, marketing, and strengthening links with consumers to shape a more sustainable regional food system.

The 1997 projects continue to cover the full spectrum. They range from a region-wide research effort to update phosphorus recommendations for corn to a consumer education effort aimed at boosting demand for local, ecologically grown apples.

The projects also reflect the kinds of information farmers who are transitioning to more sustainable methods want. For example, one project will explore the effectiveness of homeopathic remedies to treat mastitis and calf scours, responding to dairy farmers’ — and consumers’ — interest in alternatives to antibiotic treatments.

“In my mind, sustainable agriculture is really about constructing a humane, profitable, and environmentally sound food system to make sure that all people have access to adequate quantities of good quality food,” says Magdoff.

Grant Awards

The region awarded roughly \$1.46 million to 17 research, education and on-farm demonstration projects. These projects bring approximately \$1 million in matching funds to these efforts.

Several of these projects will work to develop biological controls for pests in fruit, ornamental and vegetable production. They also include market-oriented projects aimed at helping to connect Northeast producers with urban and suburban consumers and to tap into the region’s ethnic markets.

Farmer Grants

Through the Northeast SARE Program’s Farmer/Grower Grant program, \$97,693 was awarded to 29 producer-managed projects. These producers are providing over \$272,000 in matching contributions to these projects.

Professional Development

The region awarded \$445,976 to nine projects through which Extension personnel and other agency field staff will learn about sustainable agriculture concepts and practices. Additionally, \$10,000 was awarded to each land grant in the region to implement and coordinate state training programs.

**As Northeast SARE
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Training the Trainers, 1994-1998: Progress and Challenges

By Herb Cole

In the four years since SARE's professional development program began, it has become apparent to me that from production to processing to marketing, Northeast agriculture is extremely diverse, reflecting to a large extent the land resource base of the various states. New England's glacially derived soils with short growing seasons differ vastly from the limestone soils of the mid-Atlantic ridge and valley area or the sandy coastal plain soils of New Jersey, Maryland, and Delaware.

Traditional dairy and crop farming is disappearing from large areas of New England. If current trends continue, farm numbers in several New England states may not be sufficient to support the essential farm service infrastructure of equipment and supply dealers.

In contrast, in parts of the mid-Atlantic area, the problem is *too much* intensive agriculture. Corn/soybean production is being combined with large hog, poultry and dairy operations which follow an industrial model of production, processing, and marketing.

Between these extremes are the varying sizes of dairy, livestock, field crop, fruit, and vegetable farms throughout the northeast—all struggling to sustain themselves. The SARE-supported sustainable agriculture efforts of the 12 Northeast states reflect this diversity. Still, there remains a core of similar challenges across all states of the Northeast—farming systems which cannot sustain farm families, and/or which negatively impact soils, water, and other aspects of the environment.

The professional development efforts in all Northeast states are increasingly dedicated to helping extension professionals understand soil quality issues and how they impact overall environmental quality, especially ground and surface water.

SARE PDP efforts are also helping field personnel learn how to integrate IPM into whole farm crop and animal management systems, and to utilize new knowledge regarding biological and cultural pest management to improve the capability of extension field personnel to assist organic farmers.

SARE's professional development projects increasingly emphasize whole-farm management concerns, both in terms of planning and business management, and as reflections of farm family values and goals.

Feedback from projects shows that participants are increasingly concerned with the relationship between farms, their communities and the food system as a whole. We're learning that local and state governments must create and maintain a favorable regulatory climate for farming, farm product marketing, and the supply and service infrastructure that sustains our farming and food system. But it will not occur if farms are viewed as an environmental detriment, due to noise, odor, fly, or pollution concerns. Through several SARE projects field personnel are learning how to facilitate improved dialogue and collaboration between farmers and their community.

Through the continuing effort of the SARE Professional Development Program and its trainers training the trainers, initiatives, I've seen a difference in the kinds of questions agricultural professionals are asking. More and more often, the question is "How do we change?" rather than "Why should we change?" To me, this shift of one word, symbolizes a sea change in the course of agricultural history.

Herb Cole is coordinator of the SARE Professional Development Program. He can be reached at 814-863-7235. A list of the state coordinators is on page 188.

Between the extremes are the varying sizes of dairy, livestock, field crop, fruit, and vegetable farms throughout the northeast—all struggling to learn how to sustain themselves. The SARE-supported sustainable agriculture efforts of the 12 Northeast states reflect this diversity.

Farmer-to-Farmer Compost Exchange

Agronomic Systems

Key Findings

The Farmer-to-Farmer Compost Exchange project was an on-farm demonstration that evaluated a leaf/manure compost operation on a dairy farm in terms of nutrient management and economic feasibility. We also sought to increase the use of compost as a soil amendment on commercial farms. We found:

- Composting leaves with manure is a cost-effective agricultural waste management technique in a dairy operation;
- After five years of land-applying compost, the test farm no longer needs commercial applications of P or K for corn silage production; this equates to a savings of almost \$2,000 per yr;
- Compost use for field operations by farmers is cost and equipment dependent—many agricultural operations do not have equipment for hauling and spreading compost; and
- Combining leaves with manure at a nearby farm resolves a municipal solid waste disposal problem in an environmentally compatible manner.

Objectives

1. Evaluation of the use of composted municipal leaves and animal wastes as a viable nutrient management practice for dairy operations and feasibility of using dairy farms as leaf composting facilities.
2. Analyses of two types of compost: leaf compost alone, and leaf/manure compost to develop recommendations for application to other farm and land use operations.
3. Educate area farmers on use of compost as a soil amendment and determine feasibility of developing a farmer-to-farmer compost exchange program.
4. Have demonstration fields of three different types of area agricultural operations. Evaluate agricultural fields, with compost applied, for crop yield changes and potential use of compost as a best management practice (BMP) for water quality protection, inclusive of nutrient management, integrated pest management (IPM) and soil erosion control.
5. Assess marketability of compost for other land use practices in the area and establish a potential marketing network.

Method and Findings

This project focused on assessing compost operations at Powder Hill Farm and the use of compost on area demonstration sites. Four demonstration plots were established on commercial growing operations and two on state properties. Appraisal means included: field sampling and analysis of compost; evaluation and

Coordinator

Denise Savageau
Hartford County Soil & Water
Conservation District
627 River Street
Windsor, CT 06095

Phone: 860-688-7725

Fax: 860-683-1808

Collaborators

Aqua Solutions
Connecticut Agricultural
Experimental Station
Ct. Farm Bureau
Connecticut Department of
Environmental Protection
Hartford County Soil & Water
Conservation District
Tolland County Soil & Water
Conservation District
University of Connecticut
USDA—NRCS
Connecticut farmers

ACE Grant

\$34,000

Match

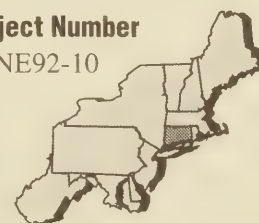
\$117,180

Duration

1992 to 1997

Project Number

ANE92-10



modification of compost operations; evaluation of leaf/manure composting as agricultural BMP; on-farm demonstrations at three commercial farms and two state facilities; and outreach opportunities for other uses. In general, results of the project were positive. The farmer found composting to be a viable way to manage the disposal of municipal leaves and dairy manure. Windrowing allowed for the use of existing equipment, had no electricity requirements and produced a uniform product. It is, however, labor intensive and weather dependent. Commercial growers generally found the compost to be a good soil amendment and potting medium. Off-farm use appears to be more limited because of the lack of market development and competition from less costly products rather than for technical reasons.

Windrow composting began over four years ago and continues today. When the town delivers leaves in the fall, usually November, windrows are formed ranging from 10 to 12 feet high by 15 to 20 at the base by 150 to 200 feet long. Leaves are added to manure in loafing areas (10:1 ratio) to improve its bulk and stiffness for ease of handling. The manure/leaf mixture is then added to windrows with a manure spreader. Piles are turned between four and nine times per year dependent upon weather conditions and the farmer's work load. After composting, piles are allowed to cure 60 to 180 days. Piling and mixing is done with a front-end loader. A home-made trommel screener is used for final processing.

In the initial stages, two types of compost were developed: 1) leaves composted separately, and, 2) leaves composted with manure. Leaves alone took many weeks longer to compost than the combined materials. They also provided little intrinsic value for

nutrient management in an operation where manure is the main problem waste stream that needs to be handled. Without a leaf/manure blend, the farmer felt impelled to charge a higher tipping fee for the leaves because he still had to deal with the manure.

Composting leaves alone was determined to be cost prohibitive in lieu of capital expenditures required for construction of manure holding lagoons, and therefore, was abandoned early on. Front-end difficulties with Enfield's leaf pick up procedures and schedules led to an educational outreach program with the town. For the compost operation to be successful, the delivery of leaves to the farm needs to be timely and the leaves need to be free of debris. Municipal procedures (including efforts to increase citizen awareness of the need for a clean leaf source) were changed successfully.

The development of a farmer-to-farmer compost exchange program turned out to be a more difficult task than anticipated. What became obvious was the lack of necessary equipment by most commercial agricultural operations to transport and spread the compost in the fields. Operations not requiring field spreading, such as potted flower and vegetable greenhouses, found the compost to be invaluable.

During 1995 Collins noted a marked increase in sales of compost to home gardeners. Strong positive feelings were expressed about the use of natural compost compared to other commercially available soil amendments. Two commercial potted vegetable and flower plant greenhouse operations began to use the compost in 1995 and continue to today. Weed seed growth continues to be one drawback.

During the second growing season it became obvious that our focus on particular

types of commercial growers was becoming somewhat overshadowed by other types of agricultural producers, e.g., greenhouses. Lack of adequate transportation and land application equipment appeared to be drawbacks for widespread use of compost in field cropping operations.

During the course of this study, other uses of Collin's compost have included:

- as a mulch in reclaiming an abandoned sand & gravel pit;
- as an admixture with topsoil for a new lawn at the Enfield public works department garage;
- as a bedding for growing bait worms;
- as a soil amendment to naturally low organic soils for vegetable crops grown by Foodshare, a nonprofit group that assists low-income inner-city families;
- as a growth medium for a raised bed demonstration at the Audubon Society's farm in Pomfret;
- as part of an ongoing research project being conducted by the University of Massachusetts comparing differing types of composts to facilitate the growth of vegetable crops in low organic soils of the Connecticut River valley; and,
- as a filtering medium for the renovation of stormwater runoff from a commercial parking lot. Each of these uses are efforts at seeking out potential future markets.

Conclusions

Project results indicated the following:

- 1) a clean source of leaves is necessary to produce a high quality compost;
- 2) education of municipal personnel and citizens on proper leaf pick up, handling and delivery is important;
- 3) composting leaves with manure is a cost-effective agricultural waste management

technique in a dairy operation;

- 4) consistent, high-quality compost is the most marketable;
- 5) compost use for field operations by farmers is cost and equipment dependent — many agricultural operations do not have equipment for hauling and spreading compost;
- 6) leaf/manure compost appears to have a higher intrinsic value to greenhouses, gardeners and landscapers than it does in field crop applications;
- 7) dependency on municipal leaves as a carbon source is also subject to the municipal competitive bidding process;
- 8) as an agricultural waste management technique for dairy manure, composting can eliminate the need for a capital investment of up to \$65,000; and
- 9) off-farm sales require a concerted marketing effort.

Composting is an environmentally sound and productive way to manage and recycle leaves and dairy manure. The product of composting is easier to handle, has a smaller volume and is a more stable than the input materials. While compost can be land applied to decrease the need for nutrients from commercial fertilizers, composted by-products may also be marketed for higher value. After five years of land applying compost, Powder Hill Farm no longer uses commercial applications of phosphorus and potash in areas of silage corn production, approximately 120 acres. It appears the leaf/manure compost is serving as an adequate source of phosphorus (P) and potassium (K). Formerly, 50 pounds of P and 100 pounds of K were applied. At a cost of \$250/ton and \$190/ton, respectively, this amounts to a savings of \$1,890 annually. Similarly, liming that was formerly applied

Project number
ANE92-10

every other year is no longer necessary. Applied 1 ton/acre at a cost of \$32/ton, this amounts to a net savings of \$3,840/year of application.

Other soil improvements noted by the farmer include:

- 1) more drought resistance due to increase in organic matter;
- 2) better tilth—now plows 12 inches to 14 inches compared to 10 inches to 12 inches and,
- 3) fields are more homogeneous, i.e., smooth, resulting in more uniform crop production.

Farm management improvements include:

- 1) odor reduction resulting in fewer complaints from neighbors;
- 2) reduction of nuisance fly problems;
- 3) more timely spring-time field work because leaf/manure compost is field

stacked during the winter and ready for immediate application; and,

- 4) avoidance of a costly liquid manure lagoon, i.e., up to \$65,000 structure.

From a municipal standpoint, combining leaves with manure at a nearby farm resolves a solid waste disposal problem in an environmentally compatible manner. In terms of water quality, by reducing manure runoff from stockpiles and early season land spreading both surface and ground water stand to improve by implementing field application of compost. As a nutrient management technique, it is minimizing edge-of-field delivery of nutrients and limits leaching from the root zone. Based on this study, composting of leaves and manure should be considered as a best management practice for nutrient management and agricultural waste management.

Reported December 1997.

Development of Sustainable Cropping Systems for New York Cash Crop Producers

Agronomic Systems

Key Findings

Field-scale demonstrations with farmers performing all field operations demonstrated that soybean-corn or soybean-wheat/clover-corn rotations can enhance corn yields, allow reduced pesticide use, and improve farm profitability compared to continuous corn.

More specifically, the project showed that:

- soybean-wheat/clover-corn or soybean-corn rotations compared with a continuous corn rotation increases corn yields by 10 percent while using 100 percent less insecticide, 60 percent less herbicide, and 25 percent less fertilizer nitrogen;
- rotated corn had a greater net return (\$120/acre) compared to continuous corn (\$44/acre) because of higher yields and lower pesticide and fertilizer costs (\$81 and \$122/acre, respectively);
- the soybean-corn rotation had greater net returns (\$88/acre) compared with continuous corn because of the much greater net return for rotated corn and slightly higher net return for soybean when compared with continuous corn; and
- without harvesting and marketing wheat straw, the soybean-wheat/clover-corn rotation had the same net return as the continuous corn. If we marketed the straw, which most wheat growers do, we would have received an additional \$75/acre net return to the wheat crop and thus an additional \$25/acre net return to the soybean-wheat/clover-corn rotation.

Objectives

1. To inform New York cash crop producers and the related agricultural industry about the need for sustainable cropping systems and to recommend the adoption of economically viable cash-crop farming systems that minimize chemical inputs and maintain soil and water quality.
2. To help New York cash crop producers develop sustainable cropping systems that increase small grain and soybean acreage and reduce corn acreage in their cropping systems.
3. To identify the best sequence of crops in a sustainable cropping system for New York cash crop producers that maximizes profit and is environmentally compatible through the minimization of chemical inputs.

Findings and Results

The goal of this study was to demonstrate to New York grain producers that soybean-corn or soybean-wheat/clover-corn rotations under reduced inputs (banded herbicides plus cultivation and about 100 lbs. N/acre) compared with a

Coordinator

William J. Cox
Soil, Crop and Atmospheric
Sciences
Cornell University
141 Emerson Hall
Ithaca, NY 14853

Phone: 607-255-1758
Fax: 607-255-6143
Email: WJC3@cornell.edu

Collaborators

Cornell University and
Cooperative Extension
New York Farmers

SARE/ACE Grants

\$100,789

Match

\$178,756

Duration

1993 to 1997

Project Numbers

ANE92.8 & LNE94-51



Project Numbers

ANE92.8 &
LNE94-51

continuous corn rotation under full inputs (soil insecticide, broadcast herbicides, and about 140 lbs. N/acre) enhance corn yields and improve farm profitability.

Field-scale demonstrations with participating farmers performing all field operations were established on four cash grain farms in New York in 1993.

Corn: When averaged across years (1994 to 1996) and sites, corn in the soybean-wheat/clover-corn and soybean-corn rotations compared with continuous corn yielded about 10 percent more (141, 139, and 127 bu/acre, respectively). Corn yielded higher in eight of 12 site-year comparisons in the soybean-wheat/clover corn rotation and in seven of the 12 site-year comparisons in the soybean-corn rotation when compared with the continuous corn rotation.

The major challenges where corn did not respond positively to rotations were adequate corn stand establishment and weed control in the soybean-wheat/clover-corn rotation and adequate N fertility in the soybean-corn rotation. Nevertheless, we successfully demonstrated that soybean-wheat/clover-corn or soybean-corn rotations compared with a continuous corn rotation increases corn yields by 10 percent while using 100 percent less insecticide, 60 percent less herbicide, and 25 percent less fertilizer N.

Wheat: When averaged across years and sites, wheat yielded 55 bu/acre in the soybean-wheat/clover-corn rotation and soybeans yielded 47 bu/acre in the soybean-wheat/clover-corn and soybean-corn rotations.

Soybeans: The soybean crop had an averaged net return of \$56/acre, whereas the wheat crop had a \$-33/acre net return, partly because of the clover seed costs (\$25/acre). Rotated corn had a greater net return (\$120/

acre) compared with continuous corn (\$44/acre) because of higher yields and lower pesticide and fertilizer costs (\$81 and \$122/acre, respectively). Consequently, the soybean-corn rotation had greater net returns (\$88/acre) compared with continuous corn because of the much greater net return for rotated corn and slightly higher net return for soybean when compared with continuous corn.

The soybean-wheat/clover-corn rotation, however, had the same net return (\$49/acre) as the continuous corn rotation because of the negative net return of wheat. The harvesting and marketing of wheat straw, which most wheat growers do, would add an additional \$75/acre net return to the wheat crop and thus an additional \$25/acre net return to the soybean-wheat/clover-corn rotation. Unfortunately, we were not able to measure straw yields accurately in our demonstration.

A detailed discussion of the crop yields, production costs, economic returns and management issues for each site for each year is available through Northeast Region SARE.

Site Information

In Cayuga Co., the field demonstration is on Vaill Acres in the Finger Lakes Region of NY. Norm Vaill farms about 550 total acres of which 400 acres are corn, 100 acres are soybeans, 25 acres are hay, and 25 acres are wheat. Norm grows most of his corn and sunflowers under a ridge tillage system that features banded herbicides with timely cultivation(s) for the weed control program.

In Orleans Co., the field demonstration is on the 1,500-acre Roberts Brothers farm in Medina. In most years, about 800 acres are planted to corn, 200 acres to soybeans, 300 acres to wheat, and 200 acres to peas.

In Seneca Co., the field demonstration is

located on Doug Freier's 1,200-acre farm near Geneva. About 400 acres are planted to corn, 400 acres to beans, 200 acres to wheat, 200 acres to hay, and 100 acres to peas.

In Yates Co., the field demonstration is located on Larry Anderson's 250-acre farm near Penn Yann. About 175 acres are planted to corn and 75 acres planted to soybeans.

Input Reduction

We can illustrate the benefits of crop rotation to the environment of soybean, and 150 acres of wheat, based on current NY crop acreage. With this acreage distribution, only 275 acres of corn follows soybean or wheat so there are 250 acres of non-rotated corn.

If cash croppers adopt more diverse rotations, the environmental benefits could be substantial. For example, eliminating about 250 acres of continuous corn and substituting about 250 acres of soybeans would eliminate 37,500 lbs of fertilizer N on continuous corn (250 acres of non-rotated corn x 150 lbs N/acre). Also, the substituted 250 acres of soybeans would not require the soil applied insecticide (1 lb/acre) for CRW control on non-rotated corn for a savings of 250 lbs of insecticide.

Dissemination of Findings

A county extension newsletter, entitled "Rotated Corn Can Enhance Corn Yields with Less Inputs," was distributed statewide

in March of 1997 describing the importance of crop rotation in sustainable cropping systems. Also, we contributed an article to Country Folks, a weekly farm newspaper, in the New York Corn Growers section in November.

Practical Applications

The results of our demonstration appear to have already had an impact. In 1993, 56,000 acres of soybeans were produced in New York. In 1997, soybean acreage almost doubled to 107,000 acres. This represents a potential reduction of 50,000 acres of continuous corn in New York. Also, wheat acreage increased from 95,000 to 135,000 acres in New York. This represents another potential reduction of 40,000 acres of continuous corn. The reduction of continuous corn in New York should also reduce pesticide and N fertilizer use significantly.

Operational Recommendations

We recommend that New York cash grain producers allocate two-thirds of their land area to a soybean-corn rotation and one-third of the land area to a soybean-wheat/clover-corn rotation. Also, growers can reduce herbicide use by banding herbicides at planting, followed by a timely cultivation(s) for weed control.

Reported January 1998.

Project Numbers

ANE92.8 &
LNE94-51

Utilization of a Neem Product in a Reduced Synthetic Chemical Insecticide Management Program for Colorado Potato Beetle

Agronomic Systems

Key Findings

This project was conducted on commercial and organic farms to demonstrate the efficacy and cost of different strategies for utilizing a neem-based insecticide for reducing crop damage caused by Colorado potato beetle (CPB) on potato farms.

The results suggest that the amount of conventional insecticide used for CPB management can be reduced by applying neem-based insecticide to interfere with CPB egg-laying activity, followed by larvicidal applications of neem, Bt, or conventional insecticides.

On the commercial farm, CPB egg-laying was reduced by 70 percent with two applications of neem and was reduced by 53 percent with a single half-rate application of imidicloprid. We found no treatment-related effects on non-target arthropod pests (flea beetles, aphids) or beneficial arthropods (ladybugs, spiders).

At the organic farm, all three treatment regimes were effective in keeping CPB densities below recommended threshold levels, however neem mixed with *Bacillus thuringiensis* (Bt) was less effective than either material alone. Bt was more effective than neem or the neem-Bt mix in reducing the density of summer-generation CPB adults and resulted in 10 percent higher tuber yields. Neem reduced densities of the black and red stinkbug (an unusual pest of potatoes) but also appeared to have a deleterious impact on ladybugs (an important group of beneficial insect predators).

At present, the high cost of neem products is prohibitive, however, with increased demand and competition, and improved extraction efficiency it may be more affordable in the near future.

Objectives

1. Demonstrate the effectiveness of a neem product used to reduce crop damage by the Colorado potato beetle through interference with egg-laying.
2. Demonstrate the costs and effectiveness of a neem product used in combination or in rotation with conventional chemical or microbial insecticides in a reduced insecticide management program for Colorado potato beetle on commercial potato farms.

Background

This project was conducted to demonstrate the efficacy and cost of different strategies for utilizing a neem-based insecticide for reducing crop damage caused by Colorado potato beetle (CPB) on commercial potato farms. In addition we examined effects on non-target arthropods, including natural enemies and other potato pests.

Coordinator

Kathleen Murray
University of Maine
Department of Biological
Sciences
5722 Deering Hall
Orono, ME 04469

Phone: 207-581-2944

Fax: 207-581-2969

Email:

murray@maine.maine.edu

Collaborators

University of Maine
University of Maine
Cooperative Extension
Maine farmers

SARE Grant

\$18,245

Match

\$13,291

Duration

October, 1995 to December,
1997

Project Number

ANE95.27



Neem seed extracts are known to be highly effective against a number of insect pests, but the utility of these natural plant-derived products as an alternative to, or in combination with conventional synthetic insecticides, are not well recognized in the US.

We designed several treatment regimes to demonstrate the efficacy and cost effectiveness of a two-pronged strategy for utilizing a neem product in combination with other insecticides against the Colorado potato beetle in potatoes.

A commercially available neem formulation was applied to half of the fields early in the season in an effort to reduce colonization of potato fields by interfering with egg-laying. In mid-season, efficacy and effects on non-target arthropods were compared among several larvicidal treatments using neem applied in rotation or tank-mixed with other insecticides.

The project was conceived and designed in collaboration with Brian Campbell, a potato farmer located in Central Maine. Before planting we recruited another Central Maine farm, Hillacre Farms, owned and operated by Carl W. Smith and Carl E. Smith. Unfortunately, after considerable effort in planning the project with these farmers, establishing plots, and scouting fields, we found that densities of Colorado potato beetle were exceptionally and unexpectedly low throughout central Maine (lowest densities in 6-8 years). The fields were almost completely uninfested at both farms. Therefore we had to abandon these plots and relocate the project to northern Maine after the start of the growing season. Although this presented a challenge, we were able to conduct the demonstration at two Aroostook County farms.

Activities and Results

At a 300-acre conventional potato farm we compared costs, efficacy, and non-target impacts of neem product (Align 3EC, Biosys Corp.) applications timed to reduce CPB egg-laying, followed by applications of neem used in rotation or mixed with the conventional insecticide imidacloprid (Provado 1.6F, Bayer Corp.) for management of Colorado potato beetle.

At an organic farm, we compared three treatment regimes: neem alone; Bt, a microbial-based insecticide product applied alone; and neem and Bt mixed together.

At the conventional farm, we found the CPB egg-laying rate (numbers of eggs produced per adult beetle) was reduced by 70 percent with two applications of neem and was reduced by 53 percent with a single half-rate application of imidicloprid. In comparison, egg-laying rates doubled when no adult-targeted spray was applied. However, two applications of neem (one adult spray followed by one larvicidal application) was insufficient to keep CPB below recommended threshold densities. In contrast to earlier studies showing enhanced efficacy when neem was applied in rotation with some conventional insecticides, we were unable to demonstrate that neem increased effectiveness when applied either in rotation with, or mixed with, imidicloprid. We found no treatment-related effects on non-target arthropod pests (flea beetles, aphids) or beneficial arthropods (ladybugs, spiders).

At the organic farm, all three treatment regimes were effective in keeping CPB densities below recommended threshold levels, however neem mixed with Bt was less effective than either material alone. Compared with neem or the neem+Bt mix, Bt was more effective in reducing the density of summer-generation CPB

adults and resulted in 10 percent higher tuber yields. Neem reduced densities of the black and red stinkbug (an unusual pest of potatoes) but also appeared to have a deleterious impact on ladybugs (an important group of beneficial insect predators).

The results of this study indicate that the amount of conventional insecticide used for CPB management can be reduced by applying neem-based insecticide to interfere with CPB egg-laying activity, followed by larvicidal applications of neem, Bt, or conventional insecticides. Further reductions in conventional insecticide use can be accomplished by replacing the conventional material with either neem or Bt to control the early larval stages of this pest. Although this strategy is more expensive, at current product costs, than conventional insecticides used alone, we demonstrated effective pest management at high pest densities with a 30 percent reduction in the amount of conventional insecticides used. We estimate that a three-fold reduction in conventional insecticide use could be achieved on conventional farms at lower CPB densities.

In earlier research we found that mixtures of neem with reduced rates of other conventional insecticides produced a synergistic effect, thus providing good control of CPB larvae with very small amounts of conventional insecticides. In this study, however, we found that adding neem to imidacloprid did not provide any added benefit. Imidacloprid was equally effective alone or in mixture with neem. Furthermore, we found that a mixture of neem plus Bt was less effective than Bt alone, indicating that neem and Bt are not compatible with one another in an insecticide mixture.

Laboratory assays thus far have confirmed our field observations. We found that although

Bt mixed with neem produces a synergistic effect against newly hatched CPB, the effect is antagonistic against 2-day old larvae. Similarly, when neem was followed by Bt, the effect was additive, but when Bt was applied first, followed by neem, the combination was less effective than either material alone. Thus, the effect of the mixture or a sequential treatment of neem and Bt in the field, with larvae of various ages present at once, would be expected to be less effective than either material applied alone. Similar tests with neem and imidacloprid are almost complete. The results of these assays will be included as an addendum to this report when completed.

Recommendations

Because of prohibitively high prices for neem products and pending completion of laboratory studies, no recommendations are yet proposed.

Areas Needing Additional Study

Research into the efficacy of neem products for plant disease management is needed. Neem is known to have anti-fungal properties. Further research into the effects of neem on non-target arthropods is needed. Our study indicates that neem may have deleterious effects on some non-targets, including arthropod predators of plant pests. Most previous research in this area has been done in the laboratory. Field studies are needed to adequately assess the impact on non-target organisms. Research leading to formulation and commercialization of other plant-derived products for pest management is needed. Increased availability and enhanced technology leading to affordability of neem and other natural products is needed.

Reported November 1997.

Biological/Biorational Management Program for Potato Pests

Agronomic Systems

Key findings

This project compares the effectiveness of different combinations of four biologically based pest management agents for control of aphids and Colorado potato beetle (CPB) in potatoes.

First-year results indicate that some treatment combinations are more effective than others against CPB. Three combinations maintained densities of large larvae (the most damaging stage) below economic thresholds.

Laboratory assays currently underway will provide supporting data for determining the effects of timing, sequence, and mixtures of the biorational controls on CPB larval survival.

Objectives

1. Compare the effectiveness of combinations and rotations of two biorational insecticides *Bacillus thuringiensis* (Bt) and neem extract and releases of two natural enemies the fungal pathogen, *Beauveria bassiana* (Bb) and the predator, *Perillus bioculatus* (Pb) against Colorado potato beetle and aphids in potatoes (years 1 and 2).
2. Compare the effectiveness of the most promising combinations and rotations from objective 1 across several soil amendment, potato variety, and possibly irrigation regimes in large plot field tests in reducing insect pest populations, protecting natural enemy populations, and maintaining the quality and quantity of potato tuber yields at harvest (year 2).

Approach and Methods

The conventional approach to potato pest management is heavily reliant on the use of chemical insecticides. Such reliance has led to deleterious environmental impacts and the development of genetically based insecticide resistance among insect pest populations.

There are several biological or biorational agents which are registered for use in potatoes which could be used as safer alternatives to conventional chemical insecticides. Some of these materials may be more effective if used in combinations that take advantage of their biological effects on insects, such as feeding interference, slowed development, or altered physiology. However, the compatibility of these agents with one another has not been previously examined.

This project compares the effectiveness of different combinations of four biologically based pest management agents for control of aphids and Colorado potato beetle (CPB) in potatoes. These four agents, a botanical insecticide made from neem seed extracts, the bacterial insecticide *Bacillus thuringiensis* (Bt), the insect fungal pathogen *Beauveria bassiana* (Bb), and the stink bug predator *Perillus bioculatus* (Pb) were applied in all one-way and two-way combinations to determine

Coordinator

Kathleen Murray
University of Maine
Department of Biological
Sciences
5722 Deering Hall
Orono, ME 04469

Phone: 207-581-2944

Fax: 207-581-2969

Email:

murray@maine.maine.edu

Collaborators

University of Maine
University of Maine
Cooperative Extension

ACE Grant

\$50,000

Match

\$41,528

Duration

February, 1997 to June 1999

Project Number

ANE96.31



Project Number

ANE96.31

which combinations were most effective for potato pest management.

The first-year results of this study indicate that some treatment combinations are more effective than others against CPB. Only three of the treatments (Bt alone, Bt + Bb, and Bt + Pb) maintained densities of large larvae (the most damaging stage) below economic thresholds. Bb + neem was the least effective treatment, followed by neem alone and Bb alone. Laboratory assays currently underway will provide supporting data for determining the effects of timing, sequence, and mixtures of Bt, Bb, and neem on CPB larval survival.

Of the biological agents compared, all four were compatible with one another in two-way mixtures with the single exception of Bb + neem which appears to be an antagonistic combination. We found poorer CPB control and potato yields in this combination treatment.

The best CPB control was provided by Bt. There did not appear to be any improvement in yield with the addition of any of the other three agents (Bb, neem, or Pb) to Bt. There was no evidence of synergism among any of the other agents in the field tests, although neem+Bt did appear to have an additive effect on CPB control. Bb+neem appeared to be an antagonistic, or less than additive, combination. That is, CPB control and tuber yields were lower with this treatment than the sums of Bb alone and neem alone.

At present, the high costs of neem and Bb are prohibitive for practical use for potato insect pest management, however, with

increased demand and competition, and improved extraction efficiency it is hopeful that the price will be more affordable in the near future.

Similarly, the predatory insects used in this study are not commercially available at present, however, it is hoped that these predators, presently reared only experimentally, will be available from commercial insectaries in the future.

Potential Contributions

We showed that half of the biological treatment combinations tested provided control of potato pests below economic thresholds with no use of conventional insecticides. Conventional growers in this region usually apply imidicloprid (Admire) at planting to all of their acreage, therefore there is no opportunity for using IPM practices. Some conventional growers substitute foliar applications of imidicloprid (Provado) or other chemical insecticides during the growing season, and can afford some pesticide savings by scouting and spraying only when densities exceed economic thresholds, but apply three sprays on average for control of CPb and one or more additional sprays for control of aphids. Thus we were able to save approximately 0.15 lbs or 0.25 lbs active ingredient of conventional insecticides compared with three foliar sprays or one in-furrow application of imidacloprid per acre, respectively.

Reported December 1997.

Optimizing use of Grass on Dairy Farms for Environmental/Economic Sustainability

Agronomic Systems

Findings to Date

This is the third growing season of a three-year experimental project initiated to develop and validate best management practices for perennial grasses on Northeast dairy farms and to promote increased use of perennial grasses for nutrient/manure management and for profitability.

Results indicate that managed grass is profitable, and is more profitable the higher that grain prices rise. Prior to the completion of this project in June, 1998, we will attempt to quantify exact levels of fertilization to balance economic return while minimizing environmental consequences.

Objectives

1. To identify the optimum forage quality of perennial grasses for dairy cows to maximize profitability and to verify results through animal feeding trials.
2. To determine the appropriate harvest management to obtain optimum quality of perennial grasses, while maintaining stand persistence.
3. To develop an economic budget to demonstrate the advantages of proper grass and manure management on dairy farms and encourage increased use of perennial grasses.
4. To carry out a case farm study to demonstrate new BMP's for optimum grass management, including harvest management as well as nutrient/manure management.

Method and Findings

In the second of three feeding trials for this project, grass silage was fed to dairy cows in the summer of 1997, comparing early and late maturity grass silage with alfalfa silage. Grass silage also was produced in 1997 for a third and final grass feeding trial, comparing early and late maturity grass, using dairy cows in early lactation. A third and final year of data was gathered from three perennial grass field studies to evaluate the appropriate harvest management of grasses to obtain optimum quality and maintain stand persistence.

The late cutting management grass yields averaged 0.95 tons of hay per acre more than the early cutting management. Yield of nitrogen for early cutting managements were higher than early cutting managements in 1997. Economic nitrogen fertilization rates ranged from 46 to 580 lbs N/acre across 1994, 1995, and 1996. The interaction between species and harvest management was significant, with late cut Reed Canarygrass consistently having a much higher economic N application rate than Timothy.

Coordinator

Jerome H. Cherney
Department of Soil, Crop and
Atmospheric Sciences
153 Emerson Hall
Cornell University
Ithaca, NY 14853

Phone: 607-255-0945

Fax: 607-255-6143

Email: jhc5@cornell.edu

Collaborators

Cornell University
Agrecord Management
Services

SARE Grant

\$118,024

Match

\$233,633

Duration

1995 to 1998

Project Number

LNE94-42



Nitrogen fertilization affected protein content of grasses at the first two harvests of the season, but this affect did not continue in the later harvests. Reed Canarygrass averaged 2.85 percentage units higher crude protein than Timothy. Data was gathered on 12 predominately grass-based dairy farms in southwestern New York state in 1997 to provide an economic assessment of grass for dairy cattle and to aid in the development of new best management practices.

Three years of results now clearly indicate that grass managed without some form of nitrogen fertilization will not be profitable. This project is demonstrating that managed grass is profitable, and is more profitable the higher that grain prices rise. Prior to the completion of this project in June, 1998, we will attempt to quantify exact levels of fertilization to balance economic return while minimizing environmental consequences.

Recommendations

Based on three years of results (although all results are not completely analyzed as of this date) we are suggesting the following recommendations to farmers.

a. Species selection. Consider Reed Canarygrass or Orchardgrass over Timothy (Timothy is now over 70 percent of the total grass seed sold in New York state) because of the higher level of protein in the forage across all levels of management. An early harvest management that allows for 4 cuttings/season produces a high quality forage that will allow greater flexibility in balancing rations.

b. Dry cow management. Grass fields managed to produce forage for lactating dairy cows are not appropriate for production of dry cow forage. Set aside grass fields low in available soil potassium and manage them separately for dry cow forage. Harvest grass for dry cows at or after flowering, and use regrowth forage (lowest in K) for cows near calving, when the level of potassium is most critical for animal health. Timothy is consistently lower in potassium than other grasses, while Orchardgrass is consistently higher. Fertilize grass fields for dry cow forage adequately with nitrogen, in order to deplete soil reserves of K, and produce economically-acceptable yields.

Reported December 1997.

Soil Test for Active Organic Matter: A Tool to Help Assess Soil Quality

Agronomic Systems

Findings to Date

Most of the soil functions associated with soil quality (SQ) are strongly influenced by soil organic matter, especially the small portion that is termed active organic C. This project integrates key chemical, physical and biological soil measurements, as well as farmers' experience, into a working soil quality index (SQI) that is sensitive to agronomic management. This SQI will be used to develop a rapid, easy-to-use soil-test for active C that will help target farmer fields where sustainable organic matter management practices have the greatest potential to improve yield, production stability and profits.

In the first year of the project, we sampled soils from 58 paired sites (low and high quality) which were identified by area farmers.

All the bio-physical soil quality parameters showed highly significant differences between the good and poor soils.

Collaborating farmers identified crop resistance, resistance to erosion, and water retention as the principle soil properties that indicate soil quality.

Objectives

1. Integrate key chemical, physical and biological soil properties into a working soil quality index (SQI) that rates soil function and reflects the impacts of soil management.
2. Document farmers' judgements of soil quality and use them to evaluate the SQI.
3. Develop a quick test for active soil C that correlates well with the SQI.
4. Refine the active C soil test to optimize convenience without sacrificing accuracy.
5. Predict where improved organic matter management will increase crop yields.
6. Educate agriculturalists and policy makers about uses and limitations of the new soil test.

Method and Findings

Soil quality is rapidly joining air and water quality as a major goal of natural resource management. A soil's performance of critical ecological and agronomic functions may be quantified by an SQI. Although some resource-inventory approaches to soil quality focus on permanent soil properties, our dynamic concept of SQ emphasizes soil properties that are influenced by management practices.

In the first year of the project, we sampled soils on 24 farms representing a wide range of sizes (from 25 to 6,000 acres), soils, climate, and cropping systems. The farms were located in all regions of Maryland and several parts of Delaware, Virginia, West Virginia, and Pennsylvania. Samples were also collected from

Coordinator

Ray R. Weil
Department of Agronomy
H.J. Patterson Hall
University of Maryland
College Park, MD 20742

Phone: 301-405-1314
Fax: 301-314-9049
Email: rw17@umail.umd.edu

Collaborators

Prosper
Chesapeake Bay Foundation
University of Delaware
Farmers

SARE Grant

\$100,000

Match

\$139,900

Duration

1996 to 2001

Project Number

LNE96-69



replicated experimental treatments in five ongoing cropping systems studies. The indicators that the farmers used in judging soil quality and the practices they reported for managing soil quality were analyzed. The results of a suite of biological-physical-chemical analyses were compared to farmer judgements of soil quality, and effects of experimental treatments. These parameters were then integrated into several SQ indices.

A number of potential active C-tests were also performed on the soils. Both the active C test results and the calculated SQ indices were evaluated with regard to their sensitivity to farmer judgements and experimental effects. The C-test results will be regressed against the SQI to determine which C-test is the best predictor of soil quality. We will further refine the best C-test by developing sample-handling and seasonal protocols. Using on-farm trials, we expect to prove that an active C test can identify where improved organic matter management is needed to increase yields and profitability.

Farmers will find an active C test useful for evaluating the success of their soil management practices. An active C-test also could be used for monitoring the soil quality impacts of resource conservation programs (e.g., CRP, nutrient management, compost distribution).

Since the on-farm pairs of sites were expected to have similar types of soils, it is not surprising that the standard soil tests showed little consistent difference between the sites. On well-managed farms, it is unlikely that traditional soil test parameters will limit soil quality or crop yields. Nearly all such soils

are now in the medium soil test range, or better.

In contrast, all the bio-physical soil quality parameters showed *highly* significant differences between the farmer-designated good and poor soils. These parameters included total organic carbon, an aggregate stability index (AGSTAB), a measure of total microbial biomass C (TMBC), active microbial biomass C (AMBC), and a measure of active soil carbon (sugars reactive with anthrone , ANTC). TMBC and ANTC were particularly sensitive indicators of differences between the good and poor soils. Apparently, many farmers have soils that are in poor condition (that is, do not perform up their potential), not because of N-P-K deficiencies or acidity (which are routinely and easily corrected), but because of bio-physical properties related to the management history of the soils.

In the next stage of the project, we plan to convene a panel of seven to ten of the participating farmers to judge soil quality for (unidentified) fresh pairs of soil samples from some of the farmer-designated good and poor sites. This will test the hypothesis that experienced farmers can judge soil quality on the basis of sensory information, even when field histories are not available.

So far, this study has found that both organic matter-related parameters and soil quality indices were consistently in accord with farmer-perceived differences in relative soil quality. Further study is necessary to identify if the soil quality indices (or a single active C parameter) will be useful in comparing differences in soil quality across farms.

Reported December 1997.

Managed Riparian Buffer Zones and Cover Crops to Minimize Phosphorus and Nitrogen Runoff Losses from Corn Fields

Agronomic Systems

Summary

Using a paired watershed design, participants will compare the effectiveness of managed riparian zones or cover crop systems to reduce phosphorus and nitrogen run-off from silage corn fields. Participants will also evaluate the economic impact on the farmer and will disseminate findings to farming and environmental groups. Project goals are to minimize surface water pollution by retaining nutrients in the field or buffer zone and to enhance the soil resource base and farm economics.

Objectives

1. Evaluate the effectiveness of managed riparian zone or cover crop systems at reducing phosphorus and nitrogen losses in surface runoff from silage corn fields, including an evaluation of the effect of riparian buffer width on pollutant abatement.
2. Compare the importance of surface runoff, erosion/sediment deposition, and plant uptake on loss of nitrogen and phosphorus from corn fields and retention in managed riparian zones, as well as seasonal variations of these processes.
3. Evaluate the economic impact of these management alternatives to the farmer.
4. Distribute the results of this study, both environmental and economic, to farmers and farm organizations, agricultural educators, agricultural and environmental agency personnel, industry representatives, and the general public via an extension/outreach program.

Abstract

Phosphorus and nitrogen lost from silage corn fields are significant pollutants of surface waters in the Northeast. We will evaluate pollution abatement in three different "farmer-friendly" management alternatives which do not remove cropland from production. Four small watersheds in a 15-acre field in Vermont's Champlain Valley have already been selected for this study, which includes fully monitoring runoff.

Using a paired watershed design, we will first calibrate the fields, then implement the three management systems, and finally compare reductions in phosphorus and nitrogen losses from the different treatments. Pollutant losses from the three management systems — a cover crop in corn and two riparian (streamside) buffer strips of different widths planted in grass-legume hay — will be compared against a control system of corn planted to the stream's edge. The economic impact to the farmer of the management alternatives, including crop yields, will be evaluated. Findings will be disseminated to farming and environmental groups through site visits and extension publications.

Approved for funding March 1997.

Coordinator

William Jokela
University of Vermont
Department of Plant and Soil
Sciences
Hills Building
Burlington, VT 05405-0082

Phone: 802-656-0480

Fax: 802-656-4656

Email: wjokela@zoo.uvm.edu

Collaborators

UVM Extension
Natural Resources
Conservation Service
Vermont Department of
Agriculture, Food & Markets
Champlain Valley Crop
Management Association
Vermont Farm Bureau

SARE Grant

\$142,448

Match

\$53,600

Duration

Three years

Project Number

LNE97-87



Demonstration of Narrow Row Corn Production in New York

Summary

This on-farm demonstration will evaluate the economic performance of narrow row (15-inch vs. 30-inch) silage and cash grain corn. Project goals are to show New York farmers that in narrow row corn, recommended plant population and nitrogen levels combined with reduced pesticide rates provide the most sustainable practices.

Objectives

1. To demonstrate to New York cash grain and dairy producers that narrow row corn production is economically viable under New York growing conditions.
2. To demonstrate to New York dairy producers that current recommended N rates and plant populations with reduced herbicide and insecticide rates are the most sustainable practices for narrow row corn silage production.

Abstract

Narrow row corn has elicited considerable interest nationally and in New York. Research indicates that grain corn in 15-inch vs. 30-inch rows yields 8 percent more above the 40°N latitude. Research in NY indicates that corn silage in 15- vs. 30-inch rows yields 5 to 15 percent greater. Unfortunately, on-farm observations suggest that corn silage responds best to narrow rows under high populations and N levels. Consequently, narrow row producers in NY plant at 50,000 plants/acre and manure to provide 225 lbs N/acre. This is 15,000 plants and 75 lbs N above recommended rates. Cornell research, however, indicates that economic yields occur at 33,000 plants/acre and 150 lbs N/acre. Furthermore, Cornell research suggests that half recommended herbicide and insecticide rates in narrow rows result in satisfactory weed and corn rootworm (CRW) control. Apparently, narrow row corn requires reduced rather than additional inputs.

We will conduct demonstrations on a dairy and cash grain farm in New York. We will evaluate corn silage (first, second, and third year) under three cropping systems on the dairy farm: 30-inch rows with recommended inputs; 15-inch rows with recommended population and N levels, and reduced pesticide rates; and 15-inch rows at high populations and N levels with recommended pesticide rates.

At the cash grain site, we will evaluate grain production (first and third year corn) under: 30-inch rows with recommended inputs; 15-inch rows with the same inputs; and 15-inch rows at high populations, recommended N levels, and reduced pesticide rates.

Farmers will perform all cultural practices. Cornell faculty will measure yields, soil N, weed levels, CRW damage, crop N, and silage quality. The project leader will coordinate extension activities and conduct surveys to evaluate project impacts.

Approved for funding March 1997.

Agronomic Systems

Coordinator

William Cox
Cornell University
Department of Soils & Crops
141 Emerson Hall
Ithaca, NY 14853

Phone: 607-255-1758

Fax: 607-255-6143

Email: wjc@cornell.edu

Collaborators

Western NY Crop Management
Association
Cornell University

Duration

Three years

SARE Grant

\$70,346

Match

\$163,970

Project Number

LNE97-92



Sustainable Phosphorus Fertilizer Recommendations for Corn Production in the Northeast USA

Agronomic Systems

Summary

This collaborative effort of land grant universities in all twelve Northeast region states will provide field calibration data for phosphorus recommendations for modern crop and soil conditions. The goal is to develop phosphorus recommendations that incorporate changes in soil test methodology and which are responsive to increases in soil fertility levels, higher crop yield goals, farmer's economic conditions, and general concern over water pollution from phosphorus pollution.

Objectives

1. Reevaluate corn responses to phosphorus fertilizer in the Northeast USA using current crop production technology and soil test methods.
2. Determine the soil test phosphorus level that divides responsive soils from non-responsive soils with respect to use of starter phosphorus fertilizer and broadcast phosphorus fertilizer.
3. Update phosphorus recommendations for corn production in the Northeast.
4. Educate corn producers about sustainable soil phosphorus fertility management practices.

Abstract

Soil fertility scientists within the Northeast Coordinating Committee on Soil Testing (USDA - NEC 67) agree there is a lack of current field calibration data to provide agronomically sound phosphorus recommendations for modern crop and soil conditions. The need for soil test phosphorus calibration data has become increasingly urgent due to changes in soil test methodology, increases in on-farm soil fertility levels, higher crop yield goals, concern over water pollution from excessive soil phosphorus loading, and the need to improve the economic viability and sustainability of agriculture.

To build a new soil test database, field experiments will be conducted in twelve Northeast states to evaluate corn response to starter and broadcast phosphorus at 64 field sites from 1998 to 1999. Soil samples from each of the experimental sites will be analyzed using each one of the soil test extractants (Morgan, Modified Morgan, Mehlich 1, Mehlich 3, and Bray) that are in use in the Northeast USA.

Plant tissue samples will also be collected to evaluate plant P nutritional status. All crop response data and soil samples collected will be shared among participating states. The relationship between soil test and relative yield will be examined from the pooled data. Results will be used to develop extension materials and programs that will help corn producers improve phosphorus fertilizer recommendations.

Approved for funding March 1997.

Coordinator

Joseph Heckman
Rutgers University
Plant Science Department
PO Box 231
New Brunswick, NJ 08903

Phone: 908-932-9711
Fax: 908-932-9441
Email: heckman@aesop.rutgers.edu

Collaborators

Rutgers University
University of Connecticut
University of Delaware
University of Maryland
University of Maine
University of Massachusetts
University of New Hampshire
Cornell University
University of Pennsylvania
University of Rhode Island
University of Vermont
University of West Virginia

Duration: 1998 to 2000

SARE Grant: \$92,780

Match: \$99,506

Project Number
LNE97-93



Eastern Gamagrass: Determining its Feasibility as a Forage Crop for the Northeast

Agronomic Systems

Summary

Participants will evaluate the performance of eastern gamagrass — a warm season, perennial, native grass related to corn— from establishment to full production on twelve farms in New York. Preliminary evidence suggests that eastern gamagrass can help protect or enhance highly erodible soils and/or marginally productive soils. The study will investigate the adaptability of eastern gamagrass on a variety of soil types, evaluate eastern gamagrass forage quality, and track milk production of herds fed Eastern gamagrass silage.

Objectives

1. Evaluate the adaptability and yields of eastern gamagrass on a variety of soils.
2. Evaluate eastern gamagrass's compatibility with several nurse/companion crops.
3. Evaluate the forage quality of eastern gamagrass grown at the USDA-NRCS Big Flats Plant Materials Center, Corning, NY.
4. Conduct on-farm feeding trials comparing eastern gamagrass with corn silage as a significant portion of a dairy ration.
5. Assess the on-farm economic implications of utilizing eastern gamagrass as a significant component in a dairy ration compared to corn silage.

Abstract

Eastern gamagrass, *Tripsacum dactyloides*, (L.) is a tallperennial warm season (C4) native grass. It can be used as a mechanically harvested and grazed forage. We will evaluate the performance of EGG from establishment to full production on 12 farms with six or more soil types in Montgomery and Herkimer counties in New York. A small portion of each field will be used to evaluate several companion/nurse crops. These companion crops will be evaluated for reducing soil erosion and frost heaving during the establishment year. The yield of EGG will be evaluated to determine performance on different soils and any competition from these covers.

A forage quality study will be conducted at the Big Flats Plant Material Center to get base line data for EGG grown in the Northeast. The vegetative and reproductive tillers will be harvested from the cultivar "Pete" and five other agronomically superior selections. A time of cutting study will determine the best stage to cut EGG and at what interval to cut subsequent harvests. The forage will be evaluated for percent CP, NDF, ADF, Lignin, TDOM, and digestible NDF. This information will be used in the Cornell Net Carbohydrate and Protein System to determine the amount of EGG that can be used as a component in dairy ration. Six farms will comparing two feeding systems, one with EGG at approximately 50 percent of the forage consumed versus corn silage at 50 percent. We will compare their milk production. An economic analysis will compare the two feeding systems to determine net income to farm. Educational programs for Cooperative Extension, NRCS personnel and farmers will aid in the adoption of this new crop on other farms in the Northeast.

Coordinator

Paul Salon
USDA/NRCS
Big Flats Plant Materials Ctr.
Box 360A RD 1 Rt 352
Corning, NY 14830

Phone: 607-562-8404
Fax: 607-562-8516

Collaborators

Cornell Cooperative Extension
Mohawk Valley Sustainable
Agriculture Network
SWCD

Duration

1998-2001

Grant

\$108,252

Match

\$89,488

Project Number

LNE97-96



Northeast Kingdom Nutrient Management Project

Results to Date

This project, in Vermont's Northeast Kingdom, is looking for ways to improve whole farm nutrient management practices. The focus has been on:

Reminding farmers about the value of soil and manure testing, the necessity of good record keeping, and the potential payback of good nutrient management; and,

Working with students about the relationship between farm activity and water quality.

Objectives

1. The project will demonstrate that more intensive management of nutrients across the whole farm can result in improved economics, healthy soil and crops, and a lower danger of excess nutrients going into groundwater or streams.
2. The project will involve a local conservation commission, local schools, community lay monitors and a lake association in order to involve the communities in the shared goal of sustainability.
3. The project will address nutrient imbalances within a small watershed by involving most of the farms in that watershed, including both dairy and diversified farms.

Method and Findings

The first year has been spent with the farmers in the project and with a group of students from Peacham Elementary School. Since a goal of the project has been to reduce nutrient overload in a watershed, a principal activity has been to work with the farmers on the concept of whole farm nutrient management. This included the value of soil and manure testing, the necessity of good record keeping, and the potential pay off to them economically with good nutrient management. The environmental benefits seem to be well understood by all.

Whole farm nutrient management practices are being implemented on six farms in three watersheds. Only six fields on each farm are being tested. In each case we chose fields which had been intensively cultivated and several far fields which generally had seen less attention. We took soil samples in the fall, manure samples in the spring, presidedress soil nitrate test (PSNT) samples on the corn fields in July, and made recommendations based on the information from these tests.

An assessment of each operation was completed to look at total available manure versus. land base, amount of owned versus. leased land, methods of storing, transporting and spreading manure, chemical fertilizers and amendments, crops grown and rotation practices. We had several meetings with the farmers to discuss

Agronomic Systems

Coordinator

David Machell
Caledonia County NRCD
26 Main St.
St. Johnsbury, VT 05819

Phone: 802-748-3885
Fax: 802-748-1621

Collaborators

Area farmers
Essex Natural Resources and
Conservation District
Peacham Elementary School
University of Vermont
Extension Service
USDA Natural Resources
Conservation Service

SARE Grant

\$18,920

Match

Duration

October, 1996 to November,
1999

Project number

LNE96-75



Project number
LNE96-75

the project, look at the most economical methods of fertilizing the far fields, the best use of chemical fertilizers, and the potential for sharing manure or equipment.

Although soil testing has been a service that has been available for some time, most of the farmers here have not availed themselves of the service. They have been eager to get the information from the soil tests done through the project and they have utilized it by increasing the lime applied on certain fields and adding amendments where needed. They followed our recommendations for manure applications and are rethinking their use of chemical fertilizers in some cases. More time is needed to build confidence in the value of a good nutrient management program by demonstrating the relationship between soil and manure testing, better utilization of fertilizers and improved crop production. We would anticipate better on-farm nutrient management if we can demonstrate a link between it and profitability.

The work with the students centered on the water quality of the South Peacham Brook where three of the farms are located. They learned how excess nutrients affect water quality and how they become present in the water system. Our investigations and water testing found that the brook generally has clean water because there is good riparian buffer along most of its upper reaches where our three farms are located. One set of

samples taken below Peacham in an impounded area showed high phosphorous readings, however other farms and residences located along that part of the stream where there are no buffers probably influenced the readings from that site. Some research was done to locate other groups who have tested or could test water samples from the other two watersheds.

We also investigated computer record keeping systems for this project. We worked primarily with Vermont Extension's Jeff Carter. We also devised work sheets to give the farmers that gave the recommendations for each field, the capacity of their spreaders and the number of loads which needed to be applied over a year. Record keeping continues to be a focus.

We have acquired base line data and developed a working relationship with the farmers in the project. This coming year we plan to broaden involvement to the communities where the farms are located and to all the farms in the district through our study groups, water monitoring activities and a land owner meeting.

Once we have results of the project, we anticipate seeing cost savings in decreased use of chemical fertilizers, increased production levels and better utilization of fertilizer dollars and resources by improved targeting. We would anticipate seeing improvement in the impact on the environment.

Reported November 1997.

A Systems Analysis of Organic and Transitional Dairy Production

Dairy/Livestock Systems

Key Findings

This project is collecting information on the economic, environmental and social aspects of sustainable dairy production.

The farmers participating the study found that it was economically profitable to produce milk organically. One farm increased their total farm net profit 30 percent from the first to third year of the study. Another farm increased total farm net profit more than 40 percent. The improvements were due to an increase in the price of milk per hundredweight, a decrease in production expenses and an increase in non-dairy farm income.

Control of mastitis is paramount to maximize production of high quality milk profitably. Given that organic dairy farmers are prohibited from using antibiotics to treat mastitis, they must pay more attention to preventing its occurrence. Dairy cow hygiene is the single most important management aspect in organic dairy farms. Organic producers should take extra precautions to minimize new intramammary infections during the dry period and among replacement heifers, the two critical points of entry of mastitis.

Organic dairy farming starts with a healthy, balanced soil. A soil that is well-mineralized will contribute to healthy plants and healthy animals.

Objectives

1. Assess the farm management system of four certified organic dairy farms and four transitional dairy farms.
2. Facilitate the exchange of information from farmer to farmer, and from farmer to agricultural professionals.

Results to Date

This project is collecting information on the economic, environmental and social aspects of sustainable dairy production. Data was gathered for three years and will be analyzed both quantitatively and qualitatively. We collected detailed records of costs, labor, time, inputs and production of animal and crop components on each farm. In addition, a whole-farm financial analysis was conducted on each farm, and whole-farm nutrient budgets and conservation practices will be evaluated for each case-study. Case study reports for each will be written in 1998 chapters are being written by participating farmers and researchers for the final publication.

We will produce a book on organic and transitional dairy production. It will consist of eight in-depth case studies, a chapter on making the transition to organic agriculture drawing on data from the 30-plus farms that have transitioned during the course of this project, and individual articles by farmers and researchers.

Coordinator

Enid Wonnacott
Northeast Organic Farming
Association of Vermont
PO Box 697
Richmond, VT 05477

Phone: 802-434-4122

Fax: 802-434-3608

Email:

enid.wonnacott@together.org

Collaborators

Northeast Organic Farmers
Association of Vermont
University of Vermont
Veterinarians
Farmers

SARE Grant

\$165,000

Match

\$131,108

Duration

1993 to 1998

Project number

LNE93-39



Contributions and Practical Applications

This project has the potential to contribute significantly to the dairy industry in Vermont and, with a transfer of information, to other states. Conventional dairy production is threatened by low milk prices, environmental regulation and liability, and consumer acceptance. Due to these factors, many commercial dairy farmers are interested in organic dairy farming and want concrete numbers and information about making a transition. The potential environmental benefits of organic dairy production include: a reduction in herbicide use as crops are cultivated; a decrease in surface and ground water contamination by synthetic fertilizers and pesticides; and improved soil tilth as crops are rotated with soil improving crops.

With the current consumer interest in organic milk, organic dairy farmers are being paid \$18/cwt. (hundred pounds of milk) plus a protein premium, versus \$12/cwt. for non-organic milk. While organic grain costs are higher than conventional grain, and some farmers experience a decrease in milk production, farmers estimate that there is a net economic benefit. Due to their increased milk check, the organic farmers are meeting their cost of production and are able to be better all-around managers, including upkeep of facilities and affording new manure management systems to divert primarily liquid run-off from existing storage.

Both organic and transitioning farmers have adopted new technologies or production methods. Some examples:

- One farm that has made the transition to organic production is trying alternatives to synthetic insecticides for fly control, including parasitic wasps, fly ribbons, a cone trap with yeast bait, botanical sprays and hens in the barnyard to eat fly parasites in manure.

Analysis is not complete, but the farm reported a dramatic decrease in face flies.

- Faculty from the UVM Quality Milk Research Lab worked with farmers to establish a protocol for evaluating milking equipment washing and sanitizing procedures. They used milk quality testing to analyze the effectiveness of Basic H soap as a pipeline cleaner and citric acid as an acid rinse. If enough data can be generated, farmers may be granted permission to use less caustic soaps and acids.

- An organic farm is raising calves on nurse cows to improve the health of the cow and milk quality. Their theory is that problem cows with high somatic cell counts might get better if they are nursed regularly. Results show that the nurse cows improve and can return to the milking string and that calves thrive. Other participating farms have successfully started using high count cows for nurse cows.

- One of the project farmers and two of the transitioning farmers have adopted intensive pasture management as a result of this project. With organic grain being considerably higher priced than non-organic grain, the farmers have found it economically beneficial to feed as much high quality forage as possible.

Operational Recommendations

Although we do not yet have any formal "findings" below are general observations:

- Maximize the use of high-quality forage through soil fertility management and intensive pasture management.

- Establish a relationship with a veterinarian who is familiar with herd health alternatives. Conventional animal remedies are often more expensive per treatment and have a withholding time for the milk.

- Maintain and improve soil fertility through the annual spreading of manure and natural soil amendments and through crop rotation, instead of through synthetic fertilizers.

Reported January 1998.

Nutrient Management on Maine Dairy Farms

Dairy/Livestock Systems

Summary

Through this project, we have identified farmers' questions on nutrient management and use, and are developing on-farm projects to answer these questions specifically. Producers play a central role in these activities. The project has stimulated interest in on-farm research, farmer involvement in education, and many facets of nutrient management. It has been featured in nearly 20 educational workshops and discussion groups, several field days, and many farm visits, involving over 500 farmers along with industry and state/federal agencies.

Objectives

1. Farmers will identify emerging information and technology needs for nutrient management on dairy farms and will develop site-specific criteria for making nutrient decisions.
2. On-farm evaluation of available nutrient management technologies will be conducted on at least 20 sites in Maine for two years by a team of university researchers and cooperating farmers to create a local database on crop yield and quality response. An economic evaluation of alternative nutrient management strategies will be conducted for all sites based on this dataset.
3. Two alternative nutrient management strategies, (1) manure application to seeding and established alfalfa, and (2) grass response to different forms of manure, will be evaluated in applied research projects. Results will be disseminated to all Maine dairy farmers.
4. A comprehensive management framework for record-keeping and decision-making will be developed to aid farmers in making decisions regarding nutrient use.

Methods and Findings

Through on-farm research trials and discussion groups, several broad or common issues in nutrient management have been identified and addressed by this project. These are described below, and demonstrate the progress of this project over the past year. In general, these trials have evolved from early efforts to evaluate specific technologies or decisions into current efforts to integrate these decisions into the whole farm and the surrounding environment.

Specific information on the "tools" of nutrient management was provided to many growers and industry people in a variety of forms. These include popular press and fact sheet publications and educational workshops.

Managing manure for alternative uses has garnered considerable interest in the the past year. This includes improving distribution of manure nutrients on dairy farms (especially on perennial forage crops) but also transporting manure away from nutrient-rich dairy operations onto neighboring crop farms. Several replicated on-farm projects were completed, addressing specific questions in this area.

Managing manure nutrients for maximum agronomic benefit, including timing of

Coordinator

Timothy Griffin
University of Maine
Cooperative Extension
495 College Avenue
Orono ME 04473-1294

Phone: 207-581-2942

Fax: 207-581-1301

Email:

tgriffin@umce.umext.maine.edu

Collaborators

University of Maine
Cooperative Extension
University of Maine
Experiment Station
Maine farmers

ACE Grant

\$107,000

Match

\$142,492

Duration

1994 to 1998

Project Number

ANE94.20



Project Number

ANE94.20

application and manure incorporation, continue to be important issues. Projects evaluating N testing technologies and fall vs. spring manure application for corn production were completed.

Going beyond the level of individual management practices or strategies, two larger issues have surfaced. The first is developing a realistic framework for calculating the economic value of manure. Combined with spreading costs information collected by the Androscoggin County SWCD, a conceptual framework for estimating the economic value had been developed and delivered to both farmers and extension/agency personnel. This focal area has particular relevance in reducing over-application/nutrient loading and in situations where manure is (or can be) transferred from one farm to another.

The second large-scale issue, which guides educational activities throughout this project, is developing a whole-farm view of nutrients. Specifically, nutrient management has often come to mean manure management when in fact nutrients play other roles on dairy farms. Clearly identifying these roles and their relationships is an important part of this project.

The project has also stimulated interest in on-farm research. Many of the farmers involved have identified gaps in local information. They are now beginning to see that on-farm projects are the fastest way to obtain reliable local information. They have also discussed how farmers can be more involved in the educational process in general.

For the final year of this project we will continue to distribute on-farm research information to Maine farmers; deliver educational activities demonstrating the economic and environmental aspects of nutrient management; and continue to stimulate collaborative educational efforts that will continue beyond 1998.

Economic Analysis

Many of the farms participating in this project are comparing alternative production practices to current or status quo practices. Where possible, partial budget comparisons are made for these scenarios and provided to farmers. In addition, a major thrust over the past year has been to formally develop the linkage between "potential economic value" and management decisions. For example, manure certainly has potential value if considered solely as a nutrient source. The actual economic value depends on many management decisions, from testing and calibration, through field application and management, on to additional nutrient applications and site selection. Although these have been dealt with theoretically in the past, our work has provided concrete examples of these principles using relevant information from on-farm research trials.

Farmer Adoption

Sixty-four dairy farmers have adopted various testing and management practices to increase efficiency of nutrient use. Some examples: One farmer discontinued starter fertilizer application (due to probable lack of response) on 300 acres; another increased forage grass productivity 25 percent over 400 acres by identifying specific nutrient deficiencies and developing field-specific fertilizer/manure applications. Other producers have reallocated manure from corn fields with high nutrient levels to forage seedings with low nutrient levels; used manure testing to distinguish nutrient value of fresh- versus field-stacked manure; used the PSNT to make N sidedress decisions; hosted on-farm research.

Reported December 1997.

Fescue Endophyte Research Study

Dairy/Livestock Systems

Results to Date

Participants are testing pastures for levels of endophyte in tall fescue and recommending proper grazing methods for farmers with affected fields. High endophyte levels can cause serious production losses.

Year one of this two-year project has provided documentation of fescue endophyte levels from 80 fields on 25 different farms in the Maryland, Pennsylvania, and West Virginia tri-state area. Results have shown:

- That 68 percent of the fields tested have endophyte levels at 60 percent or higher.
- The fields with "hot" pastures have been identified and made known to the farmers with recommendations as to options for managing and improving pasture quality.

Because of the variety of sites and differing effects of the fungus on livestock classes, herd health was determined too large a variable to adequately measure. We did not pursue this aspect of the research.

Objectives

1. 50 percent of all farms with Fescue pastures in Allegany County will have pasture fields tested for Fescue Endophyte by November 1, 1997.
2. 60 percent of the herds found to be grazing infected fescue will be tested to determine herd health by the end of the project.
3. By January 1, 1998, begin using the results of the Fescue Endophyte Research Study as a basis for making sustainable management recommendations to the agricultural community.
4. By January 1, 1998, conduct an agricultural demonstration field day to share with the farming community the Fescue Endophyte Research Study results.
5. By January 1, 1998, conduct a workshop for conservation groups, government agencies, and sportsmen's organizations to share results of the study and its correlation to wildlife habitat.

Methods & Findings

Farmers in the Appalachian region have planted fescue for years because of its hardiness. But high levels of a parasitic fescue endophyte can cause production losses.

The overall goal of this study is to improve the viability of small farm operators and to increase the overall health of the region's livestock population.

At the conclusion of the project, in 1998, results of the study will be included in a publication offering general guidelines and recommendations for treatment of fescue endophyte.

Reported November 1997.

Coordinator

Craig Hartsock
Allegany Soil Conservation
District
11602 Bedford Road, NE
Cumberland, MD 21502

Phone: 301-777-1747

Fax: 301-777-7632

Email:

chartsock@md.nrcs.usda.gov

Collaborators

Allegany Soil Conservation
District
Farmers in Maryland,
Pennsylvania and West
Virginia

SARE Grant

\$9,632

Match

\$7,310

Duration

1996-1998

Project number

LNE95-52



Expanding Profits for Sheep Production through Intensive Pasture Management

Dairy/Livestock Systems

Summary

Researchers and sheep producers are collaborating on an investigation of the financial viability of pasture-based sheep production using a cooperative learning and outreach model. The project is starting with case studies of Vermont sheep producers currently experimenting with pasture-based systems. Production methods and financial data is being collected and analyzed to find out if producers can make a profit by more effectively utilizing the pasture resource.

Our study is also exploring what management and/or planning tools are effective for meeting economic and lifestyle goals of sheep producers and if a cooperatively managed research and outreach program can produce more readily usable information for agricultural producers.

The number of farms participating as case studies now includes 810 breeding ewes on 10 farms in Vermont and New Hampshire. On each farm we measured pasture species composition, soil fertility, and forage quality at least once each year. We weighed lambs at least twice each year on each farm in order to measure average daily gains, and we collected flock production and financial information on an annual basis using the Standard Performance Analysis (SPA) program.

Some of the project's impacts on participating farms include:

- Decreasing or eliminating grain feeding on some farms. One producer cut the quantity of grain-fed to ewes and lambs by one-third this year. Three producers are now feeding no grain at all.
- Several producers are increasing their ewe flock size to keep up with increased pasture productivity and increased market demand.
- Several producers continue to invest in fencing to allow better grazing management over a larger number of acres. Three producers are using mob stocking to reclaim brushy overgrown pastures and improve quality and productivity.
- Two producers are now certified organic.

Objectives

1. Investigate the economic feasibility and production capacity of finishing lambs on pasture.
2. Test the applicability of management systems, specifically Holistic Resource Management (HRM) and the Standardized Performance Analysis (SPA).
3. Identify and evaluate potential alternative lamb markets as an addition to or supplement for commercial lamb sales.
4. Implement a model for cooperative research and information dissemination.

Coordinator

Kate Duesterberg
University of Vermont
Center for Sustainable
Agriculture
590 Main Street
Burlington, VT 05401-0059

Phone: 802-656-0037
Fax: 802-656-8874
Email: kduester@zoo.uvm.edu

Collaborators

UVM Extension System
UVM Center for Sustainable
Agriculture
Vermont Dept. of Agriculture
Vermont and New Hampshire
sheep producers
Vermont Sheep Breeders
Association
Vermont Lamb Promotion
Board
American Sheep Industry

SARE grant: \$82,427

Match: \$84,390

Duration: 1995 to 1998

Project Number

LNE95-54



Methods and Findings

The number of participating farms increased from six to 10 in 1997, and now includes 810 breeding ewes in Vermont and New Hampshire. On each farm we annually measured pasture species composition, soil fertility and forage quality. We weighed lambs at least twice each year on each farm in order to measure average daily gains, and collected flock production and financial information on an annual basis using the SPA program.

We measured pasture species composition in two pastures on each farm. Changes since 1995 show that as pasture management has intensified, the percentage of legumes and plant density have increased, while the percentage of weed species decreased.

On one farm, the legume content has increased from 1 percent (on a dry matter basis) in 1995 to 15 percent in 1997. It appears the change is due to grazing pastures five to seven times each year with a high stocking density so that plants are defoliated quickly, then allowing sufficient rest period for plants to fully recover. The pasture changes have improved forage nutritional content and allowed the sheep (particularly lambs) to harvest feed quickly.

Soil fertility was tested in at least two pastures on each farm. Soil on most of the farms is acidic, with low fertility. This is probably due to the fact that the majority of the farms were abandoned as dairy farms 10 to 30 years ago. Several producers are out wintering livestock and feeding out hay as a way to improve soil fertility. One producer has been able to increase soil phosphorous levels from 0.9 (very low) to 5.2 (optimum by using this technique).

Lambs were weighed at least twice on each farm during the growing season, allowing us to track average daily gain from farm to farm and from year to year. Rates of gain varied from farm to farm considerably (0.7 lbs/day to 0.35

lbs/day) due to both differences in breeding and in management style.

All the participating producers are using the SPA computerized record keeping system to track finances and production. The first and second years of data have been gathered and entered into the SPA programs for each cooperating farm. The data will be analyzed in depth during the winter of 1998.

It is important to note shortcomings with the SPA program. It cannot be used to analyze pasture species tests or the soil tests. Furthermore, there is reduced technical support for SPA because of declining funding due to the elimination of the sheep check-off. Consequently, we have to do the best we can with a very complicated data collection tool.

Several of the producers are implementing practices they learned at Holistic Resource Management courses.

The Vermont Department of Agriculture's Roger Clapp has taken the lead role in the marketing portion of the project. Clapp reports that producers' primary problem marketing to restaurants is not being able to sell the entire carcass. Restaurants prefer the better cuts — racks, loin medallions and sometimes leg meat. We have begun to address this problem through educational activities with chefs and it will continue to be a focus of the marketing activities in the next year.

Producers have been the driving force in this project from the beginning and we continue to operate cooperatively at meetings, farm visits and tours incorporated into the project. The objective of all these gatherings is for producers and agency people to learn from each other and use their collective knowledge to improve pastures for more profitable sheep production.

Reported December 1997.

Evaluation and Documentation of Homeopathic Nosodes in Organic and Conventional Dairy Production

Dairy/Livestock Systems

Summary

Participants will explore the effectiveness of homeopathic remedies to treat mastitis and calf scours. Both conventional and organic dairy farmers are interested in alternatives to antibiotic treatments because of their limited effectiveness, the risk of residues in the milk (and related price reduction), the additional financial losses farmers incur by withholding milk during withdrawal periods, and consumer pressure for antibiotic-free food products.

Objectives

1. To evaluate homeopathic nosodes in the prevention and treatment of bovine mastitis and calf scours.
2. To compare the economics of homeopathic therapy with conventional practices and to measure changes in milk quality and yields using homeopathic remedies.
3. To document the use of homeopathy on Vermont dairy farms.
4. To facilitate information exchange (farmer to farmer and farmer to agricultural professional).

Abstract

The limited effectiveness of antibiotic mastitis therapy, the combined risk of antibiotic residues and related milk price reduction, and the additional financial losses incurred by the withholding of milk during the withdrawal periods have renewed the interest in additional non-antibiotic treatments and/or alternative methods to cure mastitis.

The method that we would like to explore in this study is the effectiveness of homeopathic nosodes and other homeopathic remedies used on dairy operations.

Homeopathy is based on a simple principle that states that like treats like. It is a way of stimulating the body's vital force to cure illness. The homeopathic remedies are preparations from plants, animals, and minerals. The preparations are diluted to such a degree that even a poisonous substance is rendered safe. A nosode is "a disease product obtained from any part of the organism during illness and thereafter potentized." It works more like a vaccine in conventional medicines.

Due to the lack of efficacy of antibiotic preparations, risks of residues in foods, the cost of treating animals, and consumer demand for a healthier food product, farmers have started to inquire about homeopathy and its place in the agricultural industry. Organic dairy farmers as well as conventional dairy farmers have been using homeopathic remedies with little guidance for some time now and are demanding that more research be done to document the effectiveness of various remedies. Veterinarians are getting left behind because they want to see more

Coordinator

Lisa McCrory
Northeast Organic Farming
Association of Vermont
PO Box 697
Bridge St.
Richmond, VT 05477

Phone: 803-434-4122

Fax: 803-434-3608

Email:

enid.wonnacott@together.org

Collaborators

Northeast Organic Farming
Association
University of Vermont

Duration

1998-2000

Grant

\$161,026

Match

\$30,413

Project Number

LNE97-86



Project Number
LNE97-86

studies supporting the use of homeopathic remedies before they start to use it and recommend it to their clients.

With the use of nosodes, it will be possible to run some properly controlled trials looking at mastitis in dairy cows and heifers and ecoli in calves. We also will be able to measure the economics of using homeopathic remedies compared to conventional

practices. Along with the documented research being collected on each participating farm, it will be possible to collect a lot of anecdotal and case study information of other homeopathic remedies used that can be shared within the dairy community. This information will be shared through farmer discussion groups, farmer demonstrations, and case study reports.

Approved for funding March 1997.

Farmer-Centered, Value Added Processing and Marketing Opportunities for Northeast Dairy Farmers

Dairy/Livestock Systems

Summary

Project participants will gather information and assess the economic feasibility of farmstead or other small-scale, value-added opportunities for dairy processing as a contemporary alternative to shipping raw milk.

Objectives

1. Identify keys to success and regulatory, economic, technical, and other barriers among milk producer-handlers, farmstead dairy manufacturers, and innovative value-added processing/ marketing enterprises, especially among dairies those using cow's milk.
2. Develop and publish a series of case studies of six to 10 successful enterprises, both farmstead (producer-handler and producer-manufacturer) dairy operations and other farmer-centered, value-added dairy processing/marketing operations, identifying their strengths and weaknesses, production and marketing strategies, resources, successes, failures, and barriers.
3. Develop and publish (with case study report) engineered economic and labor budgets for various types of farmer-centered, value-added dairy processing and marketing enterprises based on an in-depth analysis of successful alternative operations.
4. Catalog and characterize land grant, extension, community economic development, organizational, and entrepreneurial activities, especially in the northeast, which support the development of farmer-centered, value-added processing and marketing enterprises, including creative business structures and arrangements that minimize or effectively manage capital investments.

Abstract

Dairy farmers generally seek solutions to their increasing financial pressures either in enhancing productivity (i.e., modernizing with a labor-saving milking parlor, expanding herd size) or reducing inputs (i.e., management intensive grazing). While the entrepreneurial spirit is alive among some dairy producers, virtually no research or extension work has been done to develop a body of knowledge on farmstead or other farmer-centered, value-added opportunities as a contemporary alternative to shipping raw milk. To tap the potential consumer demand, farmers would benefit greatly from a multi-faceted analysis of a variety of existing businesses of this kind.

There is no consensus (nor any hard data) on whether any of these businesses are economically viable. In the first year, in-depth case studies, financial and labor analyses, and exhaustive exploratory investigations will assemble data needed to answer this question. Research will lead to the production of a case study report with engineered economic and labor budgets, a farmer-friendly guide book to milk processing/marketing alternatives, and a compendium of resources. In the

Coordinator

Tracy Frisch
Regional Farm & Food Project
of Citizens' Environment
Coalition
27 Elm St.
Albany, NY 12202

Phone: 518-426-9331
Fax: 518-465-8349

Collaborators

Watershed Ag Council
Cornell University
NYS Department of
Agriculture and Markets
South Central New York
RC&D

Grant

\$53,000

Match

417,500

Duration

1998 to 2000

Project Number

LNE97-89



Project Number
LNE97-89

second year, the project will undertake, with one or two local groups of farmers, a pre-feasibility study of possible enterprises, marketing opportunities, and innovative arrangements designed to overcome time and capital barriers. A northeast regional conference will share the findings and stimulate discussion of models worthy of consideration.

The research team will be led in partnership with a consultant who has 30 years of teaching and managerial experience in the dairy processing industry. The team will involve 15 to 20 dairy farmers and agricultural

and community economic developers as participatory action research collaborators in all phases of the project. This collaboration will provide a reality check, labor, and multiple perspectives, and ensure that the project is owned by its target audience.

This project will generate guidance and resources for farmers seeking economic viability through value-adding. This strategy also holds the promise of creating relationships with consumers, and thus of greater community awareness and support for dairy farmers.

Approved for funding March 1997.

Resource Conservation and Environmental Stewardship in the Maryland "Ag in the Classroom" Curriculum Guide

Education

Background

In the Chesapeake Bay region, the agricultural community is becoming increasingly concerned with issues related to resource conservation and environmental stewardship in the wake of recent studies indicating agriculture's role as a leading contributor to the decline in health of the bay. Public awareness regarding the effects of agriculture on the bay has been slow in developing, and there have been few organized, comprehensive education programs for Maryland public schools that address these problems in a balanced way.

The Maryland Education Center for Agriculture, Science and Technology (MECAST) and the Chesapeake Audubon Society (CAS) have been working collaboratively since September of 1995 to add resource conservation components to the Maryland "Ag in the Classroom" (AITC) Curriculum Guide.

Results to Date

The consortium produced the *Sustainable Agriculture Curriculum Guide Outline*, detailing priority areas for educating students about sustainable agriculture.

Teachers attending the 1996 and 1997 annual workshops were introduced to a network of field sites throughout Maryland which offers agriculture education programming and field trip opportunities to school systems.

CAS is developing a comprehensive catalogue of agriculture education field sites throughout Maryland listing program information and other information relevant to teachers.

Objectives

1. Develop environmental stewardship and resource conservation education components for the "Maryland Ag in the Classroom" curriculum guide.
2. Integrate information on agricultural practice and human lifestyle components to address critical issues in sustainability.
3. Implement "Ag in the Classroom" summer inservice workshops for teachers with added conservation components.
4. Develop and implement teacher inservice workshops on a regional basis with field and classroom components.
5. Initiate regional follow-up activities, tracking and support for teachers.
6. Develop a network of farms and field sites to add hands-on components to "Ag in the Classroom" curricula incorporating stewardship/conservation.
7. Establish inservice opportunities throughout the state for the staff of environmental education centers, farms and other field sites.
8. Provide a model partnership for replication throughout the Chesapeake watershed, incorporating environmental and agricultural interests.

Coordinator

Richard R. Leader
Chesapeake Audubon Society
Pickering Creek Environmental Center
11450 Audubon Lane
Easton, Maryland 21601

Phone: 410- 822-4903
Fax: 410- 822-5041

Collaborators

Chesapeake Audubon Society
Maryland Agricultural Educators' Consortium
Maryland Center for Agriculture Science and Technology
Maryland Extension Service
Talbot County Farm Bureau
UMd Eastern Shore
USDA-Natural Resources Conservation Service

SARE Grant: \$70,000

Match: \$66,450

Duration

September, 1995 to December, 1997

Project Number

LNE95-61



Project Number

LNE95-61

Activities to Date

Research has shown that student performance improves when lessons are taught using an integrated, hands-on approach. With this interdisciplinary approach, students and teachers become much more excited and “learning” is assured in addition to “teaching.” MECAST and CAS have directed attention towards improving the delivery of hands-on, activities-based educational experiences for students within the AITC program.

Through the theme of sustainable agriculture children can learn practical skills in science, math, social studies, writing and the arts. Through exploration of lifestyle choices related to agriculture, nutrition and economic sustainability, they are also prepared to confront social and environmental problems in their own communities.

The work has been centered around two sets of activities. First, MECAST and CAS have made revisions to existing AITC curricula. In a combined effort, agriculture education professionals throughout Maryland performed a comprehensive review of existing educational materials related to agricultural resource conservation. Outstanding materials selected for content and quality were revised and incorporated into the AITC program. New materials were also developed that address critical issues in sustainability through the theme of agriculture. These lessons carry a strong message of environmental stewardship through a series of hands-on activities and field curricula. Materials are currently being piloted at the secondary level.

MECAST and CAS have developed teacher training initiatives to improve the quality of agriculture education in Maryland. Based on the annual AITC summer inservice workshop format, MECAST and CAS have hosted regional inservice workshops to provide local,

more intensive opportunities for teachers.

Presentations from Cooperative Extension, Farm Bureau, and Natural Resource Conservation Service staff introduced educational materials and support available through their organizations. Participants also experienced opportunities for hands-on learning during field days at local conservation learning centers to enhance their classroom teaching. Resource lists containing supplementary teaching materials and field site information offered additional opportunities for educators to use the theme of agriculture both in and out of the classroom in their teaching.

Our partnership represents a diversity of agricultural interests, ranging from organic gardening and horticulture to Best Management Practices and low-impact conventional farming, including local and state non-profits as well as government agencies. The members are dedicated to reducing the impact of agriculture on the environment while maintaining viable economic benefits for the farming community.

The “Ag in the Classroom” workshops held each summer by MECAST have been attended by over 500 teachers since the program began. Educators participating in these programs come away with classroom curricula, hands-on teaching materials, resource guides, lists of field site opportunities, supplementary teaching information, and educational support from the local agricultural community.

Teachers who attend the “Ag in the Classroom” inservice workshops are given the tools they need to educate students about agriculture and its relationship to the environment. We believe our effort to incorporate resource conservation components into the “Ag in the Classroom” program will improve children’s knowledge of farming systems and their impact on the health of the Bay.

Reported December 1997.

Compost Laboratory Education Project

Education

Summary

The Compost Laboratory Education project was conceived as an effort to involve young students in meaningful classroom activities that utilize the structure of scientific experiment to examine and evaluate the composting process.

"A teacher's guide to lesson plans and hands-on activities for studying composting in school curricula" has been developed in draft form and is being used and evaluated by teachers. A final guide should be completed in 1998.

Objectives:

1. Develop a set of classroom procedures that reveal the workings of composting.
2. Produce a manual containing the proposed methods that will ultimately be distributed throughout American school systems.

Method and Results

The Woods End Compost Laboratory Education project is developing a set of classroom procedures that reveal the workings of composting. These procedures are designed to be implemented within instructional labs and are divided into simple, mid-level and advanced categories which enable teachers to adapt them to lower, middle and upper school curricula. The resulting manual will ultimately be distributed across America.

The contract team operates a research and testing laboratory that has specialized in compost analysis over many years. It was the special challenge of this group to distill a set of procedures, from amongst many lab techniques, that would fit within the structure of classroom labs and provide highly meaningful content to teachers and students.

A principal focus of the laboratory program is to reveal bio-degradation by various chemistry steps. These include evaluating heat-energy production in insulated compost vessels, microbial respiration and microbial plate counts. To reveal respiration, the manual focuses on a number of CO₂ techniques using simple tests to more elaborate equipment.

Activities developed as part of the Compost Laboratory Education Project were piloted in 1997 and included:

- Self-heating of compost employing simple passive bench-scale vessels for the younger students and a classroom composter equipped with active aeration for the more advanced students;
- Microbial respiration demonstration and quantitative CO₂ measurements
- Bean seed simulation of bacteria counting;
- Microbial Identification: (bacteria/fungi) plate counts and microbial observation;
- Plant Growth Bioassay: demonstrating positive/negative effects of compost in simple growth setups.

Coordinators

William Brinton, Marjo Iken
Woods End Agricultural
Institute
Old Rome Road
Rte. 2, Box 1850
Mt. Vernon, ME 04352

Phone: 207-293-2457
Fax: 207-293-2488

Collaborators

Conway Grammar School
Franklin County Tech School
Hampshire College
Smith Vocational and
Agricultural High School

SARE Grant

\$51,650

Match

\$2,900

Duration

September, 1996 to August,
1998

Project number

LNE96-71



Project number
LNE96-71

We based the evaluation of our program on assessment of student progress in combination with other teacher-generated assessment criteria.

1. Elementary grade school students were expected to gain an introductory understanding of the basic concepts involved in the decomposition, ways to access compost activity and stability, and the major microbial groups involved. Fifth graders were given a comprehensive written test upon request of their teacher.

2. Ninth and tenth grade student assessment, conducted by the participating teachers, was based on student performance in the daily activities as well as their participation in class-wide discussions focusing on student observations, data interpretation, and concepts relevant to the activities.

3. All teacher participants in the inservice training were asked to fill out evaluation forms.

A final outcome of the program is a classroom laboratory manual providing structured student activities to investigate the process and product of composting.

The principal focus of the laboratory manual is bio-degradation and quality of the end product. The manual provides a broad range of activities that support compost education in the framework of practical and experimental programs.

Sections of the manual are as follows.

- The Why and Wherefore of Compost Field Trips
- Basics of Making Good Compost
- Self-Heating of Compost
- Microscopic Observation of Microbes
- Carbon-Dioxide Respiration Methods
- Plant Growth Bioassays
- References
- Compost Glossary
- Sources of Equipment

Reported December 1997.

Outreach and Training for On-Farm Composting

Education

Summary

The purpose of the project is to create an economically and environmentally sustainable market-based system for on-farm composting of commercial and farm organic materials.

An average of 50 tons per week of organic wastes are currently being diverted from traditional disposal methods to farms for composting.

The project has been successful in making new feedstocks available for on-farm composting by targeting potential sources of commercial compostables, creating new separation systems for large-scale generators, and facilitating the logistics of collection and transportation.

Objectives

1. Increase the number of farms that are interested in composting on-farm materials, and increase the number and proficiency of farms that are composting on-farm materials in western Massachusetts.
2. Increase the number of farms that are interested in composting commercial organic materials and increase the number and proficiency of farms that are registered with the Massachusetts Department of Food and Agriculture (MA DFA) to accept source-separated organic wastes in western Massachusetts.
3. Increase the availability of materials for composting farms in western Massachusetts.
4. Document and disseminate composting information to farmers and agencies that are working with farmers, and facilitate networking/information sharing among agencies that are working with farm composters throughout the New England region.

Methods and Findings

The Center for Ecological Technology (CET) is developing ways to encourage farm scale composting. Generally, it provides outreach and services that are targeted to the specific needs and motivations of each project participant. In order to maximize participation and long-term sustainability, CET works with many farmers, waste generators and haulers while not interfering with competitive market forces (e.g., pricing or directing materials to specific locations).

The project is proceeding successfully and according to schedule, with encouraging results. To date, CET has worked with 30 farmers, 10 large-scale waste generators and 8 commercial waste haulers. In addition, significant amounts of materials created on the farm are being composted.

Farmers and waste generators have responded enthusiastically. Some farmers are primarily interested in managing materials generated on the farm, including

Coordinator

John Majercak
Center for Ecological
Technology
26 Market Street
Northampton, MA 01060

Phone: 413-586-7340
Fax: 413-586-7351
Email: cetnoho@aol.com

Collaborators

Area farmers
Center for Ecological
Technology
MA Conservation Districts
MA Farm Bureau
MA Department of
Environmental Protection
MA Department of Food and
Agriculture, Amherst
Natural Resource Conservation
Service
New England Small Farm
Institute
University of Massachusetts
Cooperative Extension

SARE Grant

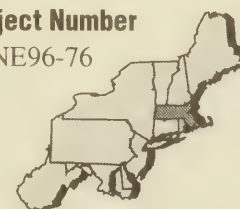
\$60,091

Match

\$157,000

Project Number

LNE96-76



Project Number
LNE96-76

manures and bedding. Other farmers would like to pursue commercial organics composting as an economic enterprise on the farm. Both types of farms need technical assistance in planning and operating compost sites in an efficient, effective and appropriate manner. Waste generators are seeking lower-cost disposal options for their organic materials. They have needed assistance to ensure that their compostable waste has extremely low levels of contamination, which is crucial for the success of farm composting.

Diverted materials have included preconsumer processing wastes and food wastes, waxed cardboard, wet corrugated cardboard, non-recyclable paper, manure and bedding materials, yard and leaf waste, and pallets.

Waste haulers have responded to customer demand for compost diversion services, as opposed to actively seeking this type of business. However, two haulers are considering doing some marketing of their collection service for compostables.

The progressive policies of the MA DFA, which encourage on-farm composting while keeping necessary environmental safeguards in place, are an invaluable asset to this

project. Cooperation between project staff and MA DFA representatives has had synergistic effects. Many farms are interested in obtaining MA DFA's approval to accept off-farm organics, however, the period of time between the introduction of the idea and actual acceptance of off-farm materials is often considerable. Even if the farmer has a suitable site and equipment available, the process proceeds (or not) at a rate determined by many other factors, such as the individual farmer's interest, schedule, and experience. In practice, DFA's approval is often regarded as a learner's permit as opposed to an "operator's license". In general, the project advises farmers to build up their composting operations slowly, so that any concerns or problems can be dealt with effectively as they arise.

CET will continue to work with farmers to build regional capacity for composting of commercial wastes. As this capacity is created, organic waste generators will be added to increase the amount of material diverted to local farms. Documentation and dissemination of project information will occur at the end of the project.

Reported December 1997.

New England Sustainable Agriculture Conference - 1997

Education

Background

The UVM Center for Sustainable Agriculture, working closely with an established network of agencies and farm organizations throughout New England, organized and hosted *Practical Partnerships: A New England Sustainable Agriculture Conference* on November 16-18, 1997.

Objectives

1. Provide a forum for extension and USDA agency personnel to interact with farmers so that these groups can learn from each other and identify ways to work together to enhance the viability of New England farmers and the farming community.
2. Impart practical knowledge to agency people on ecologically and economically sound farming techniques that are being used and improved upon by farmers or developed by researchers or extension, and are therefore readily accessible to other farmers
3. Provide practical skills to agency people in the areas of participatory education and research in order to facilitate wider utilization of farmer-based knowledge and to encourage collaborative problem solving.

Method and Findings

In planning for this conference, the UVM Center for Sustainable Agriculture established a regional planning committee that included representatives from the six New England Extension Systems, NRCS, a Soil & Water Conservation District, farm organizations (including the Maine Organic Farming and Gardening Association and the Vermont Farm Bureau), and non-profit sustainable agriculture organizations. The Northeast Sustainable Agriculture Working Group (NESAWG) co-sponsored the event and held their annual Resource Harvest in conjunction with the conference. NESAWG, a regional network of farm, environmental and consumer organizations, has been involved in efforts to promote sustainable agriculture through initiatives at the local, state, regional, and national levels, focusing on policy, food system development, and land grant sustainable agriculture programming.

The conference was held in Portland, Maine on November 16-18, 1997. Two hundred people attended the two and a half day event. Of these, approximately 80 were agency personnel (e.g., university, extension, NRCS, FSA, State Depts of Ag), 51 were farmers, and 52 were from non-profit or advocacy or educational organizations. The committee had hoped to have up to 250 people attending, but found that several other regional conferences held in the fall (such as the Northeast CSA conference held in early November and the New England Vegetable and Berry Conference planned for December) prevented a larger crowd.

Coordinator

Kate Duesterberg
UVM Center for Sustainable
Agriculture
590 Main Street
Burlington, VT 05405

Phone: 802-656-0037

Fax: 802-656-8874

Email: kduester@zoo.uvm.edu

Collaborators

Community Involved with
Sustainable Agriculture
Maine Organic Farmers and
Gardeners Association
Northeast Sustainable
Agriculture Working Group
Northeast Organic Farming
Association of Vermont
The Universities of Vermont,
Connecticut, Maine,
Massachusetts, New
Hampshire, and Rhode Island

SARE Grant: \$36,478

Match: \$6,805

Duration

1996 to 1997

Project Number

LNE96-79



Project Number

LNE96-79

Conferences coordinators emphasized collaborative working relationships throughout the conference. At each workshop, there was at least one producer to provide a farm perspective. Having these leaders in sustainable farming from all over New England sharing their experiences added a practical, applied aspect to all issues addressed. In addition, approximately one quarter of the total attendees were farmers. Their presence allowed all discussions to include constant measures of real world applications.

The goal was for participants to: learn some practical skills they could use at home; begin to think about farm problems from a whole farm perspective; be exposed to some new ideas and new ways of thinking; think about sustainable agriculture in more expansive ways, including the whole food system when appropriate; and work together —farmers, agency personnel, non-profit and industry — to address farming, community relations, and all the issues surrounding a strong

agriculture in the region. These four conference themes encompassed these areas: sustainable commodity production, whole farm planning, beyond the farm gate - community connections, and economic vitality.

Many of the ideas presented at the conference will require a great deal of strategic thinking if agencies, farmers, and other farmer advocates are to identify creative solutions. Farming issues now stretch beyond production matters. We need to think about ways to grow food more sustainably, pay farmers well, make food accessible to all, reduce our reliance on non-renewable resources, and build community. Coming to grips with such complex matters will require many more gatherings of people who care about the issues and much work in between to implement identified solutions at the local level.

Follow-up evaluations will be sent out in early summer.

Reported January 1998.

Design and Implementation of a Searchable Internet Database on Compost Production and Use

Education

Summary

This project is designed to create easy access to information on compost production, use, regulations and current projects through a network of linkages on the Internet between compost databases, bibliographies, websites, project listings, expert contacts and federal and state regulations.

Objective

Provide easy access to various types of information on compost production, use, regulations, current projects and advances by developing a network of linkages among various compost databases and the Sustainable Agriculture Network (SAN) Home Page. Information will include: existing bibliographic databases and sources for scientific and industry journal articles; surveys; research project listings (including current international studies); extension specialist contacts; field study site annotations and current disposition; federal and state regulations and guidelines (with issuing office links) for compost production and beneficial uses; and worker/farmer/neighbor health-related issues.

Abstract

Cities and farms must find safe, economical and acceptable ways to utilize the organic by-products (animal manures, landscape trimmings, and food processing, supermarket and restaurant waste) they can no longer landfill or stockpile. Rural-urban partnerships for recycling and resource conservation can be forged to close the existing gap in the production-consumption cycle. The current one-way flow of nutrients from farms to cities can be re-directed through a critical feedback loop to sustain productivity through soil organic matter replenishment. Co-composts would provide U.S. agriculture and horticulture with safe, economical, top-soil amendments and replacements. Public acceptance of co-composts is an essential component of rural-urban ventures. This project will provide the means for interested persons to easily access various types of information on compost production, use and regulations through a network of linkages among various compost databases and the Sustainable Agriculture Network Home Page. This will be accomplished by adapting the following databases for inclusion: existing bibliographic databases and sources for scientific and industry journal articles; surveys; research project listings; extension specialist contacts; field study site annotations with current disposition; federal and state regulations (with issuing office links) and guidelines for compost production and beneficial uses; and worker/ farmer/ neighbor health-related issues.

Coordinator

Patricia Millner
USDA/ARS
Bldg 001 Rm 140
BARC-West
Beltsville, MD 20705-2350

Phone: 301-504-8163

Fax: 301-504-8370

Email:

pmillner@assr.arsusda.gov

Collaborators

SAN
BioCycle Composting Council

SARE Grant

\$20,000

Match

\$33,000

Duration

1998 to 1999

Project Number

LNE97-84



Approved for funding March 1997.

Development of a Sustainable Apple Production System for the Northeast

Fruit Systems

Key Findings

Since 1988, project participants have conducted research and education programs providing growers and the public with practical information on scab-resistant cultivars and advanced integrated pest management (IPM) techniques for fresh market apple production.

The project conducted an extensive evaluation of how scab-resistant cultivars (SRCs) could contribute to more sustainable production systems. Many of the cultivars evaluated had serious flaws that limited their usefulness for commercial agriculture.

A World Wide Web site (www.orchard.uvm.edu) has been established for the dissemination of information concerning all aspects of sustainable apple production.

A publication titled *Management Guide for Low-Input Sustainable Apple Production* was authored by SARE-project participants and published in 1990.

The best immediate market potential for SRCs may exist in the low-volume direct marketing niche that constitutes an important and profitable sales outlet for many fruit growers in the Northeast.

Objectives

1. Develop sustainable apple production systems in the Northeast using scab-resistant apple cultivars and integrated pest management techniques.
2. Provide economic analyses of sustainable production systems and forecast the impact on the Northeast apple industry.
3. Expedite research and information transfer on sustainable apple production systems for the Northeast.
4. Compare potential impacts of conventional, agrochemical-intensive pest management with alternative IPM practices upon soil, water, wildlife, and beneficial fauna in the orchard agroecosystem and upon human resources.

Methods and Findings

Because of the breadth and diversity of the Northeast SARE Apple Production Project, it is difficult to succinctly summarize our accomplishments. Probably the most important achievement was the extensive evaluation of how SRCs could contribute to more sustainable production systems.

Using SRCs is one kind of pest management tactic (genetic resistance). Used in conjunction with other IPM strategies, SRCs have the potential for reducing, but not eliminating, the need for fungicides. Several impediments to fungicide reduction exist in SRC-based systems, including potential for damage from important diseases other than scab, marginal cost savings relative to increased costs for

Coordinator

Lorraine Berkett
Plant and Soil Science
Department
Hills Building
University of Vermont
Burlington, VT 05405-0082

Phone: 802-656-2630

Fax: 802-656-4656

Email: lberkett@zoo.uvm.edu

Collaborators

Cornell University
Rodale Institute
Rutgers University
University of Massachusetts
University of Vermont
Apple growers in New York,
New Jersey, Pennsylvania,
and Vermont

SARE/ACE Grants

\$1,771,202

Match

\$1,441,234

Duration

1988-1997

Project Number

LNE88-01 & ANE92-16



alternative management methods, and increased risks for some alternative methods.

Project participants have also shown that the current production methods are largely defined by the free-market system that forces growers to compete on a world market to supply consumers with a blemish-free product. SRCs that are currently available should be promoted for home garden use and for niche-market sales. Fruit quality and storage life of named SRCs are not yet good enough to warrant large commercial plantings for fresh market sales. Like any other new cultivar of apples, SRCs face formidable barriers in gaining recognition and market acceptance in fresh-market channels.

Research on IPM strategies applicable to scab-susceptible cultivars provided information that was immediately integrated into state apple IPM programs. For example, in Massachusetts, the SARE Apple Project created part of an overall apple program focused on developing and implementing advanced IPM control strategies for sooty blotch and flyspeck. Research on a computer-based predictive model for timing summer fungicides was also initiated and is being continued with other funding sources. In New York, fungicide timing studies showed that flyspeck on apple can usually be controlled by fungicides applied on a three-week interval rather than the 14-day interval that was previously recommended for this disease. In New Jersey, SARE funds enabled Rutgers Cooperative Extension to expand delivery of IPM scouting and information to an increasing number of growers.

The Management Guide for Low-Input Sustainable Apple Production, targeted for both large and small apple producers, was published. It included comprehensive chapters on economics, horticulture, and disease

and insect management, with easy-to-understand information on the best reduced-input approaches for managing orchards. In 1993 the project organized a comprehensive conference/symposium titled "Disease-Resistant Apple Cultivars: An Update on Horticulture, Pests, and Marketing." SARE project participants authored hundreds of articles and thousands of contacts were made via mass media and through presentations at grower, industry, and professional meetings.

A complex environmental question emerged from our project after several years. We had shown that SRCs enabled 50 to 100 percent reductions in fungicide. But from a broader perspective, what were the off-site and long-term savings involved when the environmental impacts of pesticides in orchard ecosystems or regional food systems were considered? We conducted a thorough review of current methodologies and databases for assessing environmental impacts of different pest-control practices. Major obstacles to meaningful, holistic impact assessment were identified—especially the lack of comparable or complete databases for pesticide effects on key processes, species, and components of agroecosystems.

Specific Findings

By 1992, project participants were working with more than 5,000 trees of SRCs in various commercial and experimental plantings. At least 30 cultivars and numbered selections were evaluated. The greatest disappointment was that most of the cultivars evaluated had serious flaws that limited their usefulness for commercial agriculture. Two of the four SRCs included in the reference planting showed a high incidence of fruit defects and have since been removed from consideration as selections that become named

cultivars, thereby reducing the usefulness of the reference planting.

Based on extensive evaluation of SRCs over an eight-year period, project participants compiled a list of potential benefits and limitations of using SRCs.

Benefits of Scab-Resistant Cultivars

1. SRCs need less fungicide. In northern growing regions where diseases other than apple scab are relatively unimportant, high-quality SRCs can be grown without fungicides in many sites and in most years. Even in more southerly regions, where SRCs may require three to five fungicide applications annually, fungicide use would still be reduced by at least 50 percent.

2. SRCs have fewer problems with mites. Fungicides have an adverse impact on mite predators. When SRCs were grown either without fungicides or with only a few summer fungicide sprays in our tests, they generally required no miticides other than the delayed-dormant oil spray each year.

3. SRCs provide new options for niche markets. Scab-resistant cultivars may gain market share if there is significant growth in demand for “ecologically-grown” produce.

4. SRCs provide quality fruit for home gardeners and small-scale farmers, groups that frequently struggle to control apple scab on conventional cultivars.

5. SRCs may have potential for commercial processing. More than half of the apples grown in the eastern U.S. are currently destined for processing, so the use of SRCs for processing could lead to a significant reduction in fungicide use. Within the last three years, breeders and processors have begun screening advanced selections of SRCs for their potential as processing apples. Factors such as fruit color, appearance, and minor

surface defects are less critical for processing than for fresh-market fruit. A few large processors willing to buy SRCs could provide an immediate outlet for thousands of tons of fruit. By comparison, getting a new cultivar established in fresh market channels requires that thousands of individual produce buyers at both the wholesale and retail levels must be convinced to change cultivars or “brand loyalty.”

Limitations of Scab-Resistant Cultivars

1. SRCs are limited by market economics. Studies revealed a major barrier to grower acceptance of SRCs. They showed that a net yearly savings of \$200 per acre could be achieved if no fungicides were needed to produce SRCs. However, the high market value and productivity of orchards (crop values exceeding \$10,000 per acre are readily attainable) means that a mere 2 percent loss in either production or sales price for SRCs relative to proven conventional cultivars would offset the savings in fungicide costs. Thus, SRCs would be profitable only if they are as productive and as marketable as proven varieties like McIntosh, Delicious, or Granny Smith. The higher prices that were anticipated for eco-labeling and reduced pesticide use in the wake of the Alar scare generally failed to materialize except in a few niche markets.

Planting new varieties is very risky for eastern apple growers wholesaling their fruit through brokers because fresh-market apples are sold and recognized by their varietal names. Under current conditions, it is very unlikely that any new apple cultivars (SRCs or scab-susceptible) can be introduced in supermarkets and achieve a measurable market share unless the introduction is supported and heavily promoted by large apple marketing groups.

Project Number

LNE88-01
& ANE92-16

2. SRCs have fruit quality limitations. None of the SRCs that we evaluated have distinctive and desirable fruit quality attributes such as those found in other recent introductions like Gala (unique flavor and appearance) or Ginger Gold (early-maturing, high-quality summer apple). Some SRCs have gained acceptance in local markets, but the perfect fresh-market SRC has yet to be developed.

3. SRCs cannot be grown without fungicides in most locations. Several diseases affect fruit during summer and must be controlled with fungicides applied during mid to late summer. As a result, the level of fungicide residues on SRC fruit at harvest will likely remain comparable to fungicide residues found on scab-susceptible cultivars because most residues come from late-summer sprays.

4. SRCs lose their resistance to apple scab if new scab strains are introduced. Scab-resistance in SRCs has a narrow genetic basis. If the SRCs were widely planted in the Northeast, they might require occasional applications of broad spectrum fungicides to forestall selection of races of *Venturia inaequalis* able to overcome the Vf and Vm resistance genes.

Economic Analysis

Economic studies of the profitability of instituting sustainable practices on apple orchards in the Northeast have focused on micro level analyses and an industry-wide analysis. A dynamic model of the U.S. apple industry, including relationships for bearing acres, production, utilization, and allocation to the fresh, canned, frozen, juice, dried and other markets, was developed and results from the model were published.

Micro-economic studies showed that growers can significantly reduce pesticide costs without compromising fruit quality by growing SRCs and using size-controlling rootstocks.

Growing SRCs with no fungicides, or with inadequate fungicide protection, can result in costly losses because summer diseases can reduce fruit quality.

For some cultivars, the increased crop value from mulched trees may justify the greater costs for the mulches.

Pesticide-use after mid-June may be substantially reduced, but at a significant cost in terms of increased management and, over three to four years, increased insect damage.

Reported October 1997.

Improving Pollination for the Northeast: On-farm Testing, Demonstration, and Management of the Alfalfa Leafcutting Bee

Fruit Systems

Key Findings

This research provides an alternative to the honey bee for blueberry and cranberry pollination, which make pollination of these economically important crops more sustainable. Our study suggests that:

- The alfalfa leafcutting bee (ALB) is a good alternative pollinator of highbush blueberry in fields that are relatively weed-free.
- Economic analyses indicate that the ALB can provide a net economic benefit to growers for blueberry, but not for cranberry at the present

Objectives

1. Test the alfalfa leafcutting bee (ALB) as a pollinator of highbush blueberry and cranberry.
2. Develop pollination management practices for the ALB designed for highbush blueberry and cranberry.
3. Demonstrate handling, care, and management practices for the ALB to farmers.
4. Evaluate the economics and cost effectiveness of using the ALB as a pollinator of blueberry and cranberry.

Method and Findings

Results from two field seasons (1995-1996) involving 15 participating farmers, combined with our greenhouse bioassay results (1995-1997) indicate that the alfalfa leafcutting bee (ALB) is a good alternative pollinator of highbush blueberry in fields that are relatively weed-free. Statistical analyses indicated that the ALB and honey bee performed similarly for both highbush and cranberry on the following parameters that measure pollinator effectiveness: fruit set, yield, berry weights, and seeds per berry. Observations of foraging behavior in the field and pollen analyses indicated that the ALB was more faithful to cranberry, whereas the honey bee was more faithful to highbush blueberry. Greenhouse flight cage studies showed that flower handling time and pollen deposition were better for the ALB than the honey bee.

Reproductive output was not high on either crop, nor on alfalfa, which suggests that at least some bees would have to be purchased on an annual basis, much like the annual renting of honey bees. In 1997, the ALB was successfully field released on lowbush blueberry by one of the participating growers demonstrating some farmer adoption of this new alternative pollinator to the honey bee for small fruits.

Specific Findings

Our fruit set findings demonstrated that the ALB is as effective as honey bees for this parameter and that the use of commercial pollinators improves fruit set.

Coordinator

Francis A. Drummond
Dept. of Biological
Sciences
5722 Deering Hall
University of Maine
Orono, ME 04469-5722

Phone: 207-581-2989

Fax: 207-581-2999

Email:

ren354@maine.maine.edu

Collaborators

University of Maine
Area farmers

SARE Grant

\$120,000

Match

\$48,908

Duration

September, 1995 to
August, 1997

Project number

ANE94-46



Project number

ANE94-46

For highbush blueberry and cranberry, fruit set was high for both the ALB and honey bees.

Several aspects of yield were investigated: 1) percentage yield (number of ripe fruits) number of flowers on marked branches or uprights), 2) average berry weight, and 3) average melanized seeds per berry. Our blueberry and cranberry findings demonstrated that the ALB is as effective as honey bees for this parameter and that the use of commercial pollinators improves yield. Highbush blueberry weights for the two year period were not significantly different which suggests that the ALB pollinates as well as honey bees and native pollinators.

The foraging behavior of the ALB in terms of fidelity to the blooming crop versus fidelity to other plants in bloom at the same time was examined. The ALB was more faithful to cranberry compared to highbush blueberry, whereas just the opposite occurred for honey bees. Native pollinators (bumble bees, andrenids and leafcutting bees) were more faithful to the blooming crop than either ALB or honey bees. Management of weeds during bloom is essential to keeping the ALB faithful to the crop, just as it is for the honey bee.

Overall, the greenhouse flight cage studies demonstrated that the ALB is a more efficient pollinator of cranberry than the honey

bee based on flower handling time and pollen deposition. No significant differences in pollen deposition existed for blueberry.

This project addressed four major management questions: 1) stocking density, 2) nesting success (production of viable offspring) on the blooming crop, 3) nesting success on a second crop (migratory strategy), and 4) nesting success on alfalfa.

Nesting success is determined by comparing the number of bees produced to the number of bees released (the reproductive ratio). In all cases the number of cells (bees) produced was less than the number of cells (bees) set out. The migratory strategy of moving the bees to new forage at the end of bloom did not significantly affect the number of bees produced. It appears that farmers will have to buy some bees from suppliers on a yearly basis much like they rent honey bee hives.

Based on the results in highbush blueberries, it seems reasonable to assume that both species provide a net benefit to growers. If honey bee supplies continue to shrink and rental prices per hive continue to rise, then ALB bees may become a profitable alternative on cranberry in the future. The costs of hive rental for honey bees in Maine in 1996 and 1997 were \$40-\$55/acre, up more than 30 percent in three years.

Reported November 1997.

Water Management to Minimize Pesticide Inputs in Cranberry Production

Fruit Systems

Key Findings

This intensive study of the use of spring flooding to control pests and reduce chemical inputs in cranberry production began in 1995. This four-week flood, known as Late Water (LW), has been shown to suppress some insects, mites, and fungi, as well as stimulate plant growth. The study focused on comparing LW bogs with standard practice (EW) ones. Key findings include:

- LW growers have been able to reduce the use of insecticides for early-season cutworms and especially for cranberry fruitworm (CFW) with no economic loss. LW reduced these populations in the year of the flood.
- LW significantly reduced fruit rot incidence, allowing growers to significantly reduce fungicide use.
- LW reduced dewberry, but was not effective on two other key weed pests.
- This research confirmed that N use may be reduced by 30 to 30 percent in the LW year without impact on yield in the year of LW or in the following year.
- On an LW bog, insecticide use can be reduced up to 60 percent, fungicide use can be reduced up to 50 percent, and nitrogen use is reduced 30 to 60 percent. Reductions vary depending on seasonal conditions.

Objectives

1. Determine the effect of LW on yield, flowering, vine growth, insect populations, disease incidence, and weed populations for the year of the LW flood and the following year.
2. Determine if the effects of LW on the plants and crop differ for the two major Massachusetts and New Jersey cultivars, Early Black and Howes.
3. Develop insecticide, fungicide, herbicide, and fertilizer use protocols as well as IPM monitoring protocols which would enhance the impacts of the LW flood for the year of LW and the following year.
4. Establish if LW can be used more often than one year in three thus further reducing pesticide inputs.
5. Investigate water quality of the LW flood: are pollutants being released in the flood water?
6. Conduct economic analysis: compare the cost of cranberry production using LW every three years to the cost of production without the use of LW.
7. Educate growers regarding the use of LW with an ultimate objective of increasing the use of this practice in the Massachusetts cranberry industry and

Coordinator

Carolyn DeMoranville
University of Massachusetts
Cranberry Experiment
Station
PO Box 569
East Wareham, MA 02538

Phone: 508-295-2212

Fax: 508-295-6387

Email:

carolynd@umext.umass.edu

Collaborators

University of Massachusetts
Cranberry Experiment
Station
Cranberry Growers Service
Ocean Spray Cranberries Inc.
USDA/ARS Blueberry and
Cranberry Research Center
Growers in Massachusetts,
New Jersey and Maine

SARE Grant

\$96,940

Match

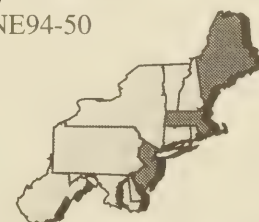
\$108,352

Duration

February, 1995 to June, 1997

Project Number

LNE94-50



introducing the practice in the Maine and New Jersey cranberry industries.

Recommendations

If possible, use LW every three years, though there are notable exceptions.

LW does not control all pests. If they are present in damaging numbers, treatments are timed based on trap catches.

Because fruitworm populations are typically strongly suppressed by LW, sprays should only be scheduled based on presence of eggs in sampled fruit.

Fungicide applications should be reduced in the year of LW and the following year. However, in the second year after LW, fungicide requirement increases.

Intensive glyphosate hand-wiping of dewberries after population reduction with LW may be economically feasible for eradicating this weed if the infestation level is low to moderate. Low rates of dichlobenil applied post-flood for dodder control do not harm cranberry plants.

Spring N application should be eliminated if a standard four-week LW flood is used. Mid season applications may be reduced, but overall N reduction should not exceed 40 percent or the following season crop may be affected.

Methods and Findings

One of the focus areas for this project was the possibility of adverse impact of LW on yield. This was the case in 1995, allowing us to define one of the conditions (abnormally warm preceding winter) that should preclude the use of LW in a given year. Note that in 1996 as in 1993 and 1994, LW had no adverse affect on yield. If yield reduction is minimized (or eliminated), cost savings due to fewer pesticide and fertilizer applications can offset any losses.

Progress has also been made in developing IPM and fertilizer protocols for LW bogs. We are: (1) investigating a pheromone-based monitoring system for late-season CFW infestations (currently, after LW, growers monitor by inspecting fruit for eggs) that will reduce grower labor and eliminate unnecessary late-season sprays; (2) looking for ways to reduce the cost of perennial weed management by integrating LW into an herbicide-wiping program, (3) determining whether fungicide use can also be reduced in the year following LW; and (4) defining the proper fertilizer practices for LW bogs so that excess growth is avoided without adverse impact on yield in the year after LW.

Specific Results

We studied the impact of LW on plant and pest populations at paired LW/EW sites in 1995 and 1996. We also assessed year-after-LW impacts on plants and diseases. In addition, we separated the plant impact and yield data for the two major cultivars: Early Black and Howes.

LW reduced the populations of early-season cutworms and cranberry fruitworm (CFW) in the year of the flood compared to those on EW bogs. The very low infestations on the LW bogs would have resulted in no recommended pesticide inputs for all but one of the LW locations. At 2 sites, sprays were applied in the middle of July targeting Sparganothis fruitworm, a pest not controlled by LW.

In both years of the study, LW bogs showed no significant increase in insect damage to fruit despite fewer insecticide applications.

LW significantly reduced fruit rot incidence allowing growers to significantly reduce fungicide use in the year of LW and in

subsequent years with no increase in incidence of upright dieback disease. We found that LW changed the populations of the fungal pathogens which cause fruit rot in cranberries. Based on these results, it is now standard practice to reduce fungicide use in the year of LW.

LW reduced dewberry (*Rubus hispidus*) populations. In addition to reducing the number of viable crowns, LW reduced the vegetative spread of dewberries. LW did not reduce populations of two other key weed pests, glaucous greenbrier or *Smilax glauca*. Nor did LW reduce the germination of dodder (*Cuscuta gronovii*) seedlings.

LW bogs had fewer uprights and flowers per unit area than did EW bogs, and uprights tended to be longer. Despite having 25 percent fewer flowers than companion EW bogs, LW bogs had less than 10 percent lower yields in 1996. Increased fruit set may overcome decreased flower number. Vegetative uprights were longer or the same length on LW than on EW bogs despite significantly lower fertilizer use.

LW impact on yield may be severe if overall growing conditions are such that crops are generally poor. In 1995 and 1996, Massachusetts cranberry crops were reduced due to several weather factors including abnormally warm winter (1994-1995) and drought conditions (1995). Yield was not reduced by LW in 1993 or 1994. LW had a large adverse effect on yield in 1995 only.

Based on the comparison of two seasons of data, it appears that current standard IPM monitoring techniques should be used on all bogs. In most cases, early-season insecticide sprays for cutworms could be eliminated on LW bogs. However, it is important for an LW grower to continue scouting for CFW eggs even if none are found soon after fruit set.

Populations may move back in from alternate hosts, the uplands, and adjacent EW bogs.

The number and rate of fungicide applications for fruit rot disease can be reduced during the first and second years after LW is used in addition to reductions (or elimination) in the year of LW. The data indicate that although a full fungicide schedule and fungicide rate are not required during the second year after late water, eliminating fungicides led to an increased incidence of fruit rot.

Even though LW floods reduce dewberry crown and runner fecundity, this single cultural practice is not sufficient to provide adequate economic control of this pest. Management must be multifaceted; the grower must be consistent and persistent in the application of any integrated program that targets dewberry.

Dichlobenil has been used on cranberry bogs as a pre-emergent herbicide to control the parasitic weed dodder. On bogs where dodder is a major problem, LW use may not be indicated. This is based on poor longevity of pre-flood casoron and dangers associated with post-flood applications (phytotoxicity), along with the fact that LW does not suppress dodder germination.

On LW bogs studied in 1995, growers reduced N use by about 70 percent, perhaps contributing to the low yield on the 1995 LW study bogs. Those same bogs recovered some in 1996 but continued to have yields 20 percent lower than their previous five year averages. Clearly such drastic reductions in N fertilizer are not warranted despite the fact that plant growth appeared normal.

Water quality was studied in ten LW floods in 1995 and 11 LW floods in 1996. Based on this research, we recommend visual monitoring for algal growth and flood temperature monitoring if ambient

Project Number
LNE94-50

temperatures are high. Ideally, temperatures in LW should be elevated (60°-65°F) to kill CFW but higher temperatures may lead to adverse plant effects. Conversely, if temperatures remain low in the flood due to inflow (stream or pumping up flood level), insect control may be compromised.

Nutrients do not appear to be dispersing into the LW flood in significant amounts. Initial residues of dichlobenil in LW floods

were highest on bogs that received 100 lb/A of the herbicide prior to the flood. There was some indication that application at least 7 days prior to the flood with adequate incorporation due to rainfall decreased the movement of the material into the flood. However, the major issue is efficacy rather than environmental impact as most of the initial residue has decayed by the time the flood is released.

Reported December 1997.

Biopesticidal Strategies for Insect Management in Cranberry

Fruit Systems

Results to Date

This project tests the effectiveness of biopesticides and trapping as methods of pest control for key pests of cranberry. The majority of insect pests affecting Massachusetts cranberry growers are contained in two complexes: the scarab root grubs (four species of beetles) and the foliage and fruit-feeding Lepidoptera (seven species of moths).

Through this project, we have developed a monitoring trap for the cranberry white grub which will soon be available commercially.

Our research indicates that none of the biopesticides currently available are effective against the cranberry fruitworm.

Tests with Spinosad were encouraging and will be continued.

Objectives

1. Management of the scarab grub complex, cranberry white grub (CWG) (*Phyllophaga anxia*), oriental beetle (OB) (*Anomala orientalis*), *Hoplia modesta* (HM), and cranberry root grub (CRG) (*Lichnanthe vulpina*).
 - A. Conduct sex pheromone studies:
 - Develop adult trap and monitoring guidelines,
 - Survey occurrence of adults on and off bogs, and
 - Evaluate mass-trapping options.
 - B. Evaluate biopesticides:
 - Bacillus thuringiensis* Buibui,
 - Insect growth regulator, RH-0345, and
 - Heterorhabditis bacteriophora* and *Steinernema glaseri* nematodes.
2. Management of lepidopteran pests with biopesticides:
 - A. At grower demonstration sites, evaluate B.t.-based products against foliage-feeding larvae; and
 - B. Evaluate tebufenizide (Confirm) against foliage- and fruit- feeding larvae.

Method and Findings

Scarab root grubs are highly problematic for MA cranberry growers because there are no management tools in place for any of the pests. Our approach to the scarab root grub complex is two-fold, involving development of monitoring traps for adults and evaluation of biopesticidal controls for larvae.

A monitoring trap is an excellent tool to determine pest identity and infestation levels for several reasons: larvae are aggregated, and thus, infestation levels are hard to accurately assess; sampling destroys the cranberry vine (a perennial); three of the four species of larvae cannot be grower-identified in the field; and work shows that each species responds differently to applications of various biopesticides.

Coordinator

Anne Averill
Department of Entomology
University of Massachusetts
Amherst, MA 01003-2410

Phone: 413-545-1054
Fax: 413-545-2115
Email: aaverill@umass.ent.edu

Collaborators

University of Massachusetts
Cornell University
Ocean Spray Cranberries

ACE Grant

\$39,996

Match

\$24,180

Duration

June 1995 to December 1997

Project number

ANE95-24



For CWG, a major accomplishment is final development of a monitoring trap, which was tested this year by nine grower cooperators. The genitalia of several thousand adult male beetles caught in these traps were examined to determine capture levels of non-target, non-pest species of June beetles. We found nearly all beetles captured were the pest species, *P. anxia*. We are now moving to commercial production of the CWG trap. A third year of mass trapping of CWG at two sites was completed. Because this insect has a three-year life cycle, next year will be the indicator year for the effectiveness of this approach.

For CRG, the two major components of a likely sex pheromone from females (Z-7 16C alcohol and Z-7 16C aldehyde) isolated last year were used in field tests at varying ratios; 1,411 males were trapped in seven treatments at five sites, with no clear differences among treatments.

Regarding evaluations of biopesticides against grub larvae, both the insect growth regulator and B.t. Buibui that we have been working with have been withdrawn by the manufacturers. On the other hand, the nematode *H. bacteriophora* appeared effective against HM in 1996 and 1997 field trials. These nematodes, if available, can be recommended at a two million rate for HM.

The second group of targeted pests is the fruit-and foliage- feeding larvae of moths, which includes the two species responsible for the majority of insecticides applied to cranberry: *Sparganothis* fruitworm (SFW)

(*Sparganothis sulfureana*) and cranberry fruitworm (CFW) (*Acrobasis vaccinii*). In research of SFW, three cranberry-registered (but not tested) formulations of B.t (Xentari, Mattch, and Crymax) were studied. Mortality after 8 days was 100 percent, ca. 25 percent, and ca. 38 percent respectively. Also with SFW, 100 percent mortality was observed on Spinosad-treated foliage. Preliminary tests with CFW were highly variable for all treatments and suggest that, for this very serious pest, none of the biopesticides currently available will be of value in management.

Biopesticides against species of spanworm, cutworm and gypsy moth were also evaluated and results are highly promising but show that B.t. recommendations will be based on additional work. There was ca. 70 percent mortality of false armyworm on Crymax-treated foliage and 100 percent mortality on Mattch-treated foliage (small larvae, 5-10mm). As soon as the larvae were a little bigger (12-18mm), mortality was half as high (ca. 30 percent with CryMax, and 38 percent with Mattch). Tests with Spinosad were impressive. All false armyworm, green spanworm, brown spanworm (*Ematurga amitaria*) and gypsy moth (*Lymantria dispar*) larvae were dead after feeding for 1-2 days on Spinosad-treated foliage. Separate dose-response lab assays on first and third-instar gypsy moth confirmed the efficacy of Spinosad as a leaf dip even at levels as low as 1/9th of field rate; efficacy of tebufenizide was also high against 1st-instar gypsy moth.

Reported November 1997.

Toward Biotoxicant Management of Key Summer Apple Pests

Fruit Systems

Key Findings

This project developed and evaluated environmentally safer alternatives to environmentally harsh pesticides to control insect and fungal pests of apples. From mid-June to harvest, apple growers in New England and other parts of the Northeast typically annually apply three sprays of insecticide to control apple maggot flies and four sprays of fungicide to control the summer diseases flyspeck and sooty blotch.

Evaluations under field conditions have shown that a low dose of a safer and highly effective insecticide (wetable powder imidacloprid) can be combined with a particular type of latex paint to provide very long and effective residual activity of imidacloprid WP.

Many growers will be able to reduce the amount of fungicide use after early June by as much as 25 to 50 percent with the use of calcium chloride (CACL2).

Objectives

1. Evaluation in commercial orchards of odor-baited toxicant-treated spheres as a replacement for organophosphate insecticide for control of apple maggot flies, the principal fruit-damaging insect pest active after mid-June.
2. Evaluation in commercial orchards of cation salts such as calcium chloride as benign replacement for harsh fungicides for control of flyspeck and sooty blotch, principal fruit-damaging disease pests active after mid-June.

Methods and Findings

For apple maggot flies, we developed odor-baited toxicant-treated red spheres that can be used to ring perimeter apple trees in orchards. The attracted maggot flies that alight on the spheres are killed and thus prevented from injuring the fruit.

Through experimentation, we refined the composition and application of materials comprising toxicant-treated spheres to a point where we now have a specific amount and formulation of a very safe toxicant (1.5 percent active ingredient of wettable powder formulation of imidacloprid) mixed with a very effective residue-extending agent for metering out imidacloprid (Glidden latex gloss enamel paint) that will kill 90 percent of alighting apple maggot flies even after 12 weeks of field exposure under 11 inches of rainfall. The amount of imidacloprid at the sphere surface is always extremely small yet is sufficient to kill nearly all alighting flies that ingest it.

The challenge becomes one of assuring presence of sufficient fly feeding stimulant (sucrose) at the sphere surface to cause flies to feed and ingest imidacloprid (which does not kill flies unless it is ingested). We have developed

Coordinator

Ron Prokopy
University of Massachusetts
Amherst MA, 01003

Phone: 413-545-1057

Collaborators

University of Massachusetts
Seven Massachusetts apple
growers

ACE Grant

\$35,175

Match

\$13,349

Duration

June, 1995 to December 31,
1997

Project number

ANE95-25



two effective approaches for assuring a continuous supply of sufficient sucrose at the sphere surface, even after 12 weeks of field exposure under high rainfall.

The first approach involves placing a ring of caramelized sucrose (analogous to a “life-saver”) atop a wooden sphere coated with red latex paint containing imidacloprid. The sucrose flows down all sides of the sphere after wetting. Wooden spheres can be used year after year and annually renewed with caramelized sucrose, latex paint and imidacloprid.

The second approach involves the entire sphere body being comprised of a mixture of sucrose, flour and glycerin (which we have optimized) overlaid (after drying) by latex paint containing imidacloprid. The sucrose seeps continuously through the latex paint during and after rainfall. Sugar/flour spheres biodegrade during autumn and disappear during winter.

In 1997, 32 blocks of apple trees were ringed either with above-type odor-baited wooden pesticide-treated red spheres, above-type odor-baited sugar/flour pesticide-treated red spheres, or odor-baited wooden sticky-coated red spheres or were sprayed three times with azinphosmethyl to control apple maggot flies. Results showed sugar/flour pesticide treated spheres to be just as effective as sticky-coated spheres and both types were nearly as effective as three sprays of azinphosmethyl. Wooden pesticide-treated spheres were somewhat less effective.

However, neither type of pesticide-treated sphere can be recommended for widespread commercial orchard use until we improve

upon the residual capacity of the ring of caramelized sucrose atop a wooden sphere and find ways of preventing growth of fungi on sugar/flour spheres and consumption of sugar/flour spheres by rodents and birds.

Development of fully-effective and economical odor-baited toxicant-treated spheres could substitute for all insecticide applied in New England apple orchards after early June. This would result in elimination of three sprays of azinphosmethyl (GUTHION) or phosmet (IMIDAN), whose use against apple maggot flies represents the sole need for a New England IPM orchardist to apply insecticide after early June. This will eliminate some applications of azinphosmethyl or three pounds per acre of phosmet per year. There is no current effective non-insecticidal alternative to use of odor-baited spheres for controlling apple maggot flies.

For the summer diseases flyspeck and sooty blotch, we used 1996 findings (showing that 3 orchard sprays of a 50:50 mixture of calcium chloride and captan were nearly as effective as orchard sprays of full rates of harsher fungicidal materials) as a basis for our 1997 state-wide recommendation that apple growers try this safer alternative approach to controlling these summer diseases.

With respect to fungicides, we anticipate a 100 percent reduction in the amount of benomyl, mancozeb or metiram normally used in four sprays after early June to control the summer diseases. The amount of captan normally used after early June will be reduced by 50 percent. Currently, there are no effective alternatives to the captan/calcium chloride combination tested here.

Reported December 1997.

Improving the Profitability and Adaptation of the High-Density Strawberry Production System for the Northeast

Fruit Systems

Key Findings

This project is investigating ways to optimize an integrated strawberry production system with improved profitability and decreased pesticide dependence. Results to date include the following:

The plasticulture strawberry production system has shown high commercial profitability in Southern New Jersey.

Three years of data demonstrate the improved profitability by vegetable double cropping and second-year strawberry harvest.

Yield of organic N nutrition treatments were superior to conventional inorganic N plots. All organic N can be preplant incorporated, eliminating fertigation cost, effort, and equipment.

Objectives

Optimize an integrated strawberry production system, involving genetic, cultural, and environmental aspects, with improved profitability and decreased pesticide dependence.

1. Investigate the influence of location, planting date, plant type, and floating row covers (FRC) utilization on earliness, productivity, quality, and profitability.
2. Compare selections (NJUS and MDUS Strawberry Breeding Programs) and eastern adapted cultivars to 'Chandler' for pest resistance, earliness, productivity, and quality.
3. Study the efficacy of poultry manure and chicken parts compost as a primary nutrient source, and/or replacement for fumigation.
4. Study double-cropping strategies with vegetables and/or renovation practices for maintaining the strawberry planting for a second production year.

Method and Findings

The Eastern United States has traditionally grown strawberries in matted rows, but there is considerable interest in adapting the high-density annual systems utilized in Florida and North Carolina. This plasticulture system is based on integrated crop management (ICM) practices which avoid and reduce disease and insect pressure. The system decreases the dependency on chemical pesticides by maintaining a microclimate which is not conducive to pest development, and by physically excluding pests from the susceptible plant material. Early results show strawberry plasticulture may be one of the most profitable crops on a per-acre basis.

The late-summer planting system includes raised beds, black plastic mulch, and trickle irrigation, with plants spaced in staggered double rows. Establishment costs are higher, but so is the value of the early high-quality crop (fruit is being sold at prices 25-40 percent higher than for matted row berries). Labor costs are reduced as there is no setting of daughter plants or hand weeding, and the fruit is

Coordinator

Joseph A. Fiola
Specialist in Small Fruit and
Viticulture
Rutgers University
Rutgers Fruit R&E Center
283 Route 539
Cream Ridge, NJ 08514

Phone: 609-758-7311
Fax: 609-758-7085
Email: fiola@esop.rutgers.edu

Collaborators

Rutgers University
Snyder Farm
Walker Brothers Farm
Hastings Organic Fruit and
Vegetable Farm
Wye Research and Education
Center

SARE Grant

\$96,204

Match

\$125,748

Duration

September, 1995 to December,
1997

Project Number

LNE95-57



more easily and efficiently harvested from the beds. Fall planting also affords relief from the heat, drought, weed and disease pressure of mid-summer.

FRC are an integral part of plasticulture, increasing flower bud initiation in the fall, providing winter and frost/freeze protection, and promoting earlier fruiting. Since the FRC promote an earlier crop, they also serve to accelerate plant development past the susceptible stage before the pest emerges. The degree of effectiveness is dependent on overwintering habits of particular insect species, as well as environmental conditions, especially in the growing season previous to the harvest season.

Currently the best strawberry system option for the Northeast is the use of costly transplant “plugs” which are propagated from actively growing runner tips. A “by-product” of the digging of fresh-dug plants are the multiple crowned “mother plants.” Based on the results of this project, the first commercial planting of fresh multiple crown mother plants was established in South Jersey. This plant type provides a buffer for late planting and reduces plant costs. Earlier planting date was comparable for yield and fruit size, allowing more flexibility with planting and establishment in diverse environments.

A critical issue facing strawberry growers involves the dependence of current strawberry production on agricultural chemicals. At the core of ICM principals is the utilization of an innate genetic resistance to pests as the most efficient means of control. The New Jersey Agricultural Experiment Station and other Eastern Breeding Programs have selec-

tions with excellent fruit flavor and size for fresh market production in the system. The genetic disease resistances and general adaptation of these selections allow them to be grown with fewer fungicides.

Another issue facing strawberry growers involves the contamination of ground water supplies from over-use of synthetic nitrogen (N) fertilizers. Plastic mulch has reduced leaching of nutrients in various vegetable research trials. Utilization of composted manure can supply the nutrients for growth but in a slow release form which will resist leaching. Strawberries also benefit from additions of organic matter. Yield of organic N nutrition treatments were superior to conventional inorganic N plots.

The high productivity of this system, coupled with the early harvest, allow a high return for inputs as well as increased opportunities for rotation and diversification. Two alternative components are available for maximizing the profitability of the system: multiple-year strawberry fruiting and double cropping with vegetable crops. Planting vegetables directly into the same beds allows maximum utilization of the inputs of bed preparation, plastic, and fertilizer.

The eastern varieties were superior to ‘Chandler’ in second-year plots, with ten of eleven yielding higher, and all having larger fruit size. For double cropping experiments, zucchini squash yield was close to 28,000 lbs/A, which is considered good yield for the Northeast, despite being cut off by an early frost. Three years of data demonstrate the improved profitability by vegetable double cropping and second-year strawberry harvest.

Reported December 1997.

Impact of Herbicides on Beneficial Insects of Blueberry and Cranberry

Fruit Systems

Summary

This two-year project is investigating the effects of herbicides on the diversity and abundance of forage plants and beneficial Hymenoptera (bees and wasps) in blueberry fields in Maine and cranberry bogs in Massachusetts.

Objectives

1. Determine the effects of herbicide use on flowering weeds (diversity and abundance) and Hymenoptera (diversity and abundance).
2. Determine the extent to which field border characteristics reduce the effects of herbicides on the diversity and abundance of Hymenoptera.
3. Determine how the abundance and diversity of beneficial Hymenoptera influences crop productivity (fruit set, berry weight, and seeds per berry).

Background

The ultimate goal of this research is more sustainable production of lowbush blueberry and cranberry through greater reliance on beneficial insects and less reliance on pesticides in these important and extensive agroecosystems.

Due to the characteristics of the cranberry and blueberry agroecosystems, we believe they are particularly susceptible to the detrimental environmental impact that herbicide applications might have on beneficial insects. Broadleaf herbicides kill plants that bees and wasps use for forage. Other herbicides control grasses, rushes, and sedges, which, while not forage plants, may provide important microhabitats for some beneficial bees and wasps. Therefore, the effects of herbicides in these agroecosystems (and the concomitant reduction of floral abundance and diversity) on the Hymenoptera provide excellent model systems for study.

Our 1997 research sampled eighteen lowbush blueberry fields and nine cranberry bogs for diversity and abundance of noncrop plants (weeds) and Hymenoptera.

It is likely that the findings will result in significantly less herbicide use in both agroecosystems. This should lead to increased natural enemy abundance and diversity and decreased insecticide use. Both increased floral diversity and decreased insecticide usage should enhance the habitat of native pollinators, making pollination more sustainable.

Lowbush blueberry is the second largest agroecosystem in Maine. The cranberry agroecosystem is a fledgling industry in Maine with major production areas in New Jersey and Massachusetts. Reduction in pesticide use in these important and extensive agroecosystems will contribute substantially to a cleaner environment and safer, healthier food.

Coordinators

Francis Drummond, Stephen Woods and Constance Stubbs
Department of Biological Sciences
5722 Deering Hall
University of Maine
Orono, ME 04469-5722

Phone: 207-581-2989

Fax: 207-581-2969

Email:
ren354@maine.maine.edu

Collaborators

University of Maine

SARE Grant

\$150,000

Match

\$148,627

Duration

Two years

Project Number

LNE 96-64



Project Number

LNE 96-64

Specific Findings

For lowbush blueberry, the number of flowering plant species present ranged from 20 species to 44 species per study site (includes species present within the adjacent forest). Fields ranged from intensively managed and relatively weed-free (6.8 percent weed cover) to organically managed fields with up to 58.3 percent weed cover.

Weed cover in cranberry ranged from less than 1 percent to 12.8 percent. For cranberry, the number of flowering plant species present ranged from 26 species to 47 species per study site. Based on m² plot counts during bloom, wild bee (*Bombus*, *Andrena*, *Halictus*, *Osmia*, etc.) abundance varied from 0.2 per m² to 1.13 per m² in lowbush blueberry. In cranberry, wild bee abundance varied from 0.02 to 0.35 per m². Students are in the process of sorting over 2,000 samples into major categories of beneficial Hymenoptera which will then be correlated with weed cover and yield findings.

In addition, aerial photos were taken of all the blueberry fields and floral distribution maps are being derived from 35 mm slides of fields. A measure of herbicide-intensity is being derived from our periodic visits to the study sites, grower spray records, and interviews with growers.

Our sampling procedure allows us to document changes in diversity and abundance from field boundaries toward the center of the field. To more fully understand the interactions that occur between the Hymenoptera of the blueberry field or cranberry bog and the adjacent forests, we extended our sampling transects into the adjacent forests at study sites. Once all samples are sorted from 1997, we will be able to determine whether smaller fields, with more forest edge, reduce the effects of herbicides on beneficial bees and wasps.

To accurately assess how the abundance and diversity of beneficial Hymenoptera influenced crop productivity more samples will need to be processed.

Reported November 1997.

Sustaining Grape Production in the Northeast Through Farm-Tested Information Technologies

Fruit Systems

Results to Date

This project uses grape growers in Pennsylvania and New York to direct the development of weather acquisition tools and a computer based decision support tool (VITIS) that would help them in making decisions on sustainable practices. VITIS will use site-specific, high-resolution weather information and predictive pest models to forecast disease levels, one and two days into the future.

Accomplishments to date include:

- We established an executive grower committee to outline, review, and evaluate the project.
- We are analyzing statistically (cluster analysis) archived weather data collected at automatic stations in New York and Pennsylvania in 1994, 1995, and 1996 to determine which stations could be clustered into similarity groups.
- We are combining Hi-Rez® climatological data sets for New York with land use information to identify climatic variation in the grape-growing regions.

Objectives

1. Use participatory grower organizations in the grape industry to develop and farm-test new information tools.
2. Evaluate the usefulness, reliability, cost and acceptance of weather information sources for grower use in sustainable vineyard management decision making.
3. Incorporate sustainable vineyard management tools, such as predictive pest models and site-specific weather information and forecasts, into the VITIS expert system and evaluate their impact on decision making in commercial vineyards.

Background

Management of pests on grapes in the northeastern United States has historically been dependent on routine pesticide applications. Growers are unable to use weather information and pest predictive models to more precisely time applications which would reduce pesticide use for several reasons: 1) site specific weather information is difficult for growers to collect and use in decision making, 2) pest scouting is time consuming and interpretation of the information is difficult, and 3) pest models have not been delivered to growers in a format they can use in decision making.

This project utilizes the knowledge of grape growers in Pennsylvania and New York to direct the development of weather acquisition tools and a computer-based decision support tool (VITIS) that would help them in making decisions on

Coordinator

James W. Travis
The Pennsylvania State
University
219 Buckhout Laboratory
University Park, PA 16802

Phone: 814-863-7235
Fax: 814-863-7217
Email: JWT2@psu.edu

Collaborators

Cornell University
National Grape Cooperative
Pennsylvania Association for
Sustainable Agriculture
Pennsylvania State University

SARE Grant

\$147,943

Match

\$74,872

Duration

January, 1997 to December,
1998

Project Number

LNE96-72



Project Number
LNE96-72

sustainable practices. VITIS will combine several sustainable vineyard management tools, such as site-specific weather information, and predictive pest models, to create an expert system for everyday grower use.

Growers from both states and subject matter specialists in plant pathology from Pennsylvania and New York have convened to determine which predictive pest models to incorporate into VITIS. Growers are participating in the design and function of the decision support system. The models use vineyard and

pest history and site-specific weather information to predict disease levels, one and two days into the future. These tools will greatly enhance the grower's ability to utilize weather information and scouting information in sustainable vineyard management.

A representative group of vineyardists from Pennsylvania and New York and a grape processor (National Foods Inc.) are serving in the development and evaluation of the new decision support system.

Reported December 1997.

Peach Orchard Ground Cover Management to Reduce Arthropod Damage

Fruit Systems

Key Findings

This project investigates the effect different ground covers may have on insect populations in peach orchards. Our study suggests the following:

- Properly managed peach orchard ground cover reduces certain insect pest pressure and subsequent damage to the crop.
- Some ground covers can effectively reduce the population of certain nematodes but simultaneously have the potential to increase others.
- None of the ground cover treatments appeared to have any effect on the level of peach disease.

Objectives

1. Demonstrate how orchard ground cover management affects arthropod abundance and damage to peaches.
2. Demonstrate suitability of selected ground covers for use in integrated crop production strategies for peaches.
3. Determine how plant parasitic nematodes are affected by ground cover type and management strategies.
4. Determine if ground cover management affects the incidence of selected peach diseases.

Methods and Results

Results of this study clearly demonstrate that peach growers participating in this project had three times less damage caused by tarnished plant bug feeding in orchard blocks with managed sod ground covers compared with fruit grown with weedy ground covers or disked orchard floors. Tarnished plant bug levels were also lower in ground covers where herbicides were used to remove broad leaf weeds and alternate host plants of this pest. This project found that certain peach diseases including brown rot, cytospora canker, and bacterial spot were not influenced by different ground cover management practices.

Recommendations

Based on this study, our recommendations include the following:

- Minimize insect pest problems and soil erosion by planting sod in drive rows instead of disking;
- Manage orchard sod to minimize insect and nematode pest pressure;
- Remove established broad leaf weeds and clover from the orchard;
- Do not mow or disk if insects are present in the ground cover to prevent them from dispersing up into the trees;
- Do not plant legumes, especially white clover, during rotations to rest the soil

Coordinator

Peter W. Shearer
Rutgers University
Rutgers Agricultural Research
& Extension Center
121 Northville Road
Bridgeton, NJ 08302

Phone: 609-455-3100

Fax: 609-455-3133

Email:

shearer@aesop.rutgers.edu

Collaborators

Rutgers Cooperative Extension
Penn State Cooperative
Extension
Area fruit farmers

SARE Grant

\$55,000

Match

\$31,718

Duration

September, 1996 to December,
1997

Project Number

LNE96-74



Project Number
LNE96-74

before replanting peaches. This should reduce plant-parasitic nematode populations and plant virus inoculum.

We expect that there will be positive impacts on overall farm productivity, the environment, and farm profits as growers adopt and successfully implement good ground cover management in their orchards. The benefits growers should see in the short-term are reduced damage from certain pests, reductions in pesticide applications because of lower pest levels, and increased profits resulting in better fruit packout (less damaged fruit) and reduced pesticide input.

Long-term benefits include reduced soil erosion because sod holds soil in place and increased soil organic matter in sod versus

disked areas. Other benefits include decreased costs and energy use because of reduced frequency of mowing slow-growing hard fescue sods compared with typical orchard grass, reduced insecticide-related bee kills because the lack of white clover in well-managed orchard ground covers should reduce bee foraging in orchards after bloom, and potentially less frost damage to crops grown with sod versus disked row middles because orchard temperatures during frosts are frequently warmer with sod ground covers compared with temperatures found in disked areas.

Reported December 1997.

A Strawberry IPM Systems Comparison Demonstration

Fruit Systems

Summary

With the goal of reducing pesticide use on strawberries, this systems comparison will integrate cultural techniques, biological controls, cultivar selection and other alternative practices to manage weeds, insects and diseases. Because strawberry growers in the Northeast often market fresh fruit through local or "pick-your-own" operations, they are perhaps more sensitive to concerns about pesticides than other fruit growers.

Abstract

This is a strawberry systems comparison trial that will demonstrate the integration of cultural techniques such as cover crops and interseeding for weed control, narrow rows and biological control for disease control, cultivar selection for insect and disease control, and vacuuming, biological control, and trap crops for insect management. Cover crops in this trial were planted in 1995 at the New York State Agricultural Experiment Station in Geneva, New York. Four strawberry cultivars were planted in 1996. Plot size is 20 x 15 meters and each treatment is replicated four times. Treatments include organic (no pesticides), future IPM (minimal pesticides), and present IPM technology. This is a long-term study that will run through the year 2000. For each system, pest densities, yield, and environmental and economic impacts will be evaluated each year. Because baseline data is available on strawberry pesticide use, surveys well be conducted at the end of this demonstration to determine the change in pesticide use patterns of New York strawberry growers. Other criteria used for measuring the success of this project will be to determine the number of growers attending meetings and field days and the number of newsletter articles written.

Approved for funding March 1997.

Coordinator

Joseph Kovach
Integrated Pest Management
Program
Cornell University
New York State Agricultural
Experiment Station
Geneva, NY 14456

Phone: 315-787-2209
Fax: 315-787-2360
Email: jk14@cornell.edu

Collaborators

Cornell University
New York Berry Growers
Association

Duration:

September 1997 to August
2000

SARE Grant

\$116,586

Match

\$31,596

Project Number

LNE97-80



Potential of Earthworms as Biocontrol Agents of Scab and Leafminers in New England Apple Orchards

Fruit Systems

Summary

This project seeks to improve apple orchard pest management and soil health through an integrated approach using the earthworm as a natural biocontrol agent. Several key apple pests — including the fungus that causes apple scab and several insects — overwinter in leaf litter on the orchard floor. In favorable soil conditions, earthworms can remove up to 90 percent of the leaf litter and therefore reduce the pests' overwintering habitat. Project participants will evaluate management strategies for their ability to enhance earthworm activity, leaf litter removal and reduce scab and leafminer pressure.

Objectives

1. Quantify leaf litter removal by earthworms as a measure of the potential of earthworms to reduce primary inoculum of *Venturia inaequalis* (the causal agent of scab) and overwintering populations of the apple blotch leafminer and spotted tentiform leafminer in New England apple orchards that use conventional, IPM/low-input sustainable or certified organic pest and crop management practices.
2. Develop case histories of orchard management in selected apple orchards throughout New England that have followed conventional, IPM/low-input sustainable and certified-organic programs of pest and crop management and compare leaf litter burial with orchard case histories to provide insight into orchard practices favorable or unfavorable to earthworms and leaf burial.
3. Develop an education and outreach plan that will introduce apple growers, fruit extension specialists, county agricultural extension agents, commercial apple consultants, and others in New England involved in apple production to the project objectives and abstract and inform them of the results and potential to increase the sustainability of their orchards, regardless of the crop production system employed.

Abstract

The earthworm, *Lumbricus terrestris*, is the most important natural biological agent that removes apple leaves from the orchard floor. Earthworms can remove more than ninety percent of the leaves in an orchard with favorable soil conditions, and this amount of earthworm activity and leaf removal improves soil health significantly and offers potential in biocontrol of three important pests.

Venturia inaequalis (V.i.) is the fungal pathogen causing apple scab, the disease responsible for most of the fungicide applied in apple orchards. V.i. overwinters in apple leaves on the orchard floor, and these scabbed leaves are the source of the inoculum that infects the leaves and fruit each spring. Two important insect pests

Coordinator

William E. MacHardy
University of New Hampshire
Department of Plant Biology
246 Spaulding Hall
Durham, NH 03824

Phone: 603-862-3846

Fax: 603-862-4157

Email:

machardy@christa.unh.edu

Collaborators

University of Connecticut
University of Maine
University of Massachusetts
University of New Hampshire
University of Rhode Island
University of Vermont

Duration

Three years

SARE Grant

\$99,790

Match

\$37,796

Project Number

LNE97-81



Project Number
LNE97-81

(spotted and apple blotch leafminers) also overwinter in apple leaves.

Removing more than seventy-five percent of the leaf litter before bud break will eliminate the need for forty to eighty percent of the fungicide applications recommended to control primary scab in orchards using the sanitation/action threshold strategy of integrated pest management being developed in New Hampshire. This much leaf removal is also expected to eliminate one or two of the three insecticide applications recommended to control the two leafminers in orchards that schedule these applications based on insect trap counts and mine assessments.

Pesticide efficiency would be increased significantly, but to achieve this, we need to have a measure of how earthworms have fared in the various management programs used in New England. That is our first objective, and we expect to identify orchards with

exceptionally high and poor leaf removal. Without appropriate chemical management, however, earthworms are not likely to be factored into the integrated strategies to manage scab and leafminers.

A second objective is to develop a detailed case history of orchard practices for each orchard in our study which, in conjunction with leaf removal data, will 1) provide insight into practices that have been favorable or unfavorable to earthworms, and 2) allow us to develop testable hypotheses and an experimental design for Phase II of this project. Improving pesticide efficiency and soil health through an integrated approach using the earthworm, a natural biocontrol agent and important member of the soil biota, will enhance orchard sustainability and economic stability.

Approved for funding March 1997.

Integrating High-Density Orchards and Biointensive Integrated Pest Management Methods in Northeastern Apple Production

Fruit Systems

Participants will develop and test biological and cultural controls for four key apple pests — flyspeck disease, mites, plum curculio and apple maggot — for which Massachusetts IPM growers still rely largely on chemical control methods. Project goals are to reduce late-season sprays for these insect and fungal pests in commercial density orchards. Overall yield and economic returns will be evaluated.

Objective

1. To largely eliminate summer pesticide use in northeastern apple orchards by developing a commercially viable, advanced, biointensive integrated pest management (IPM) system for growers.

Abstract

Apple production in the Northeast is one of the most pesticide-intensive agro-ecosystems in the nation. Most of these pesticides are used to control diseases, insects and mites. Nearly 20 years of research and implementation of integrated pest management (IPM) in apples in Massachusetts has been successful. Approximately 75 percent of the growers indicate that they use IPM, in some form, and average pesticide use on the crop in the state has dropped about 30 percent. However, these pesticide decreases have stagnated in recent years. Our analysis shows that further decreases will come from focusing on management of four key apple pests.

Chemically based management of the four pests (flyspeck disease, mites, plum curculio and apple maggot) foil attempts to firmly establish mite biocontrol and minimize late-season pesticide use. To reduce late-season pesticides, the four pests must be addressed simultaneously using biological and cultural alternatives to chemical controls. They must also be addressed in the context of high-density orchards, because growers are increasing planting density and reducing tree size to maintain economic viability.

We will develop and test a biointensive IPM system to manage each of the four key pests in commercial high-density orchards. Specifically, we will develop reliable mite biocontrol by reducing summer fungicide without sacrificing flyspeck control, eliminating some types of fungicides, introducing the hardy predator mite *Typhlodromus pyri* and reducing insecticide use against plum curculio and apple maggot. All summer insecticides will be eliminated by improving the efficiency of using red sphere border traps for apple maggot. Late spring insecticides will be reduced by developing a baited trap for plum curculio. Overall yield and returns of the advanced system in high-density and low-density blocks will be estimated to evaluate economic sustainability.

We will use on-farm research to facilitate rapid transfer of an IPM system to northeastern growers.

Coordinator

Daniel R. Cooley
University of Massachusetts
Morrill Science Center N 203
Amherst, MA 01003

Phone: 413-545-0179

Fax: 413-545-1578

Email:

dcooley@microbio.umass.edu

Collaborators

University of Massachusetts
Cornell University

Duration

Three years

SARE Grant

\$121,535

Match

\$53,973

Project Number

LNE97-90

Summary



Approved for funding March 1997.

Integrating Behavioral, Biological & Reduced-Risk Chemical Approaches in Sustainable Insect Management for Cranberries

Fruit Systems

Summary

Participants will develop a biorational integrated pest management (IPM) program to control sparganothis fruitworm and spotted fireworm, two of the most significant pests of cranberries in New Jersey. The control strategies will include mating disruption, beneficial parasites and predators of the pests, and use of a reduced-risk, selective insecticide.

Objectives

1. Develop microencapsulated formulation of E11-tetradecenyl acetate for disrupting mating in sparganothis fruitworm, *Sparganothis sulfureana* Clemens, by evaluating several rates, and monitoring the pheromone release rates of the encapsulated formulation under field conditions.
2. Evaluate the potential of the egg parasitoid, *Trichogramma minutum* Riley, in managing spotted fireworm, *Choristoneura parallela* Robinson.
3. Assess the effects of application method, rate, pest development stage, and pest species on toxicity of tebufenozide to major lepidopterous pests in New Jersey.
4. Conduct an economic and ecological analysis comparing the new and traditional insect management technologies.

Abstract

Cranberries are commercially grown on more than 28,000 acres in wet boglands in Massachusetts, Wisconsin, New Jersey, Washington, and Oregon. Cranberry is a high-value crop (production value averages \$8,000 per acre) with more than 90 percent of the crop used for processing.

Sparganothis fruitworm and spotted fireworm are the two most important insect pests of cranberries in New Jersey. Sparganothis is one of the four key pests in the major cranberry growing areas of North America. More than 90 percent of all insecticide applications in cranberries are with broad-spectrum organophosphates.

We will develop and demonstrate on grower fields in New Jersey and Massachusetts a biorational IPM program comprising disruption of mating with sex pheromones in sparganothis, biological control of spotted fireworm with *Trichogramma* egg parasitoids, and control of lepidopteran larvae with a reduced-risk, selective insecticide, tebufenozide. We will conduct an economic and ecological analysis comparing the new biorational IPM program with the traditional, broad-spectrum insecticide-based programs. The cranberry industry has an exceptionally tight-knit research, extension and grower community. More than 75 percent of the cranberry acreage in the US is owned and operated by Ocean Spray Cooperative growers. This provides an opportunity for uniquely capable private-sector participation in research, implementation, and evaluation.

Approved for funding March 1997.

Coordinator

Sridhar Polavarapu
Rutgers University
Blueberry and Cranberry
Research and Extension
Center
Chatsworth, NJ 08019

Phone: 609-726-1590

Fax: 908-932-7229

Email:

Polavarapu@aesop.rutgers.edu

Collaborators

Rutgers Cooperative Extension
Ocean Spray Cranberries

Duration

3 years

SARE Grant

\$133,179

Match

\$150,000

Project Number

LNE97-85



Commercial Small-Scale Food Processing in New York: Value-Adding for Sustainable Agriculture

Marketing

Key Findings

This project focuses on commercial small-scale food processing as a way to enhance farm income, rural employment and quality of life. It addresses technical and public policy issues crucial to small-scale food processors. Participants aim to help sustain small and medium-sized farms in the Northeast by building market opportunities.

Results to date suggest that successful entrepreneurs are those who develop attractive and unique products, devote much attention to detail in producing consistently high-quality products, creatively market these products, correctly assess potential markets, have sound business plans, and have good matches between their own characteristics and their businesses.

Barriers to establishing successful on-farm processing operations tend to be similar to those facing other small businesses. Food safety regulations can be a challenge but not as much of a barrier as participants initially thought.

In early 1998, nearing completion of the three-year effort, the formation of a statewide food processors' organization is well on its way. Strong regional chapters will promote networking and cooperation among processors. Three chapters out of an anticipated nine have officially formed.

Objectives

1. Establish a database to track farmers and other entrepreneurs starting and operating small-scale food processing businesses in New York.
2. Develop a classification of small-scale food processing businesses according to farm-based vs. non-farm-based, different information and assistance needs, income or sales classes, and types of products.
3. Identify the keys to success in small-scale food processing and also barriers.
4. Develop a series of case studies of processors.
5. Assess the need for and interest in a trade association in New York or the Northeast specifically for small-scale processors. Facilitate the establishment of such an organization, if justified.
6. Develop strategies that communities can use to promote local development through small-scale food processing.
7. Organize a statewide conference for small-scale food processors to meet with food scientists, policy makers, and regulators to discuss issues and concerns and to share information with each other.
8. Develop policy recommendations.

Coordinator

Gilbert Gillespie
Farming Alternatives Program
Rural Sociology
Cornell University
439 Warren Hall
Ithaca, NY 14853

Phone: 607-255-1675
Fax: 607-254-2896
Email: gwg2@cornell.edu

Collaborators

Cornell University
NY Sustainable Agriculture
Working Group
NY Department of Agriculture
and Markets
NY farmers and food
processors

SARE Grant

\$63,881

Match

\$15,734

Duration

Three years



Project Number

LNE95-60

Background

This project evolved out of collaboration between the New York Sustainable Agriculture Working Group (NYSAWG) and the Cornell Farming Alternatives Program (FAP) on ways to enhance the economic viability of small and medium sized farms in New York.

In the context of a global food system, increasing on-farm economic efficiency may be insufficient to maintain farms and communities in the Northeast. Producing ordinary raw agricultural products for regular markets appears increasingly to be profitable only for the largest farms. At the same time, there is evidence that consumers are not always served well by mass-marketed products, and some producers of specialty products are thriving.

Small-scale processing, particularly on-farm, enables farmers to capture more of the consumer food dollar than selling raw agricultural commodities to large processors. Research from around the country also suggests that whether they are located on farms or elsewhere in the community, small-scale processing operations also create rural jobs and help keep money circulating in their communities.

Methods and Findings

Although we initially expected regulatory requirements and food safety inspectors to be the major barriers for small-scale processors, these proved to be serious barriers only in some cases. Moreover, these anticipated barriers actually contributed to the success of some processors. Getting technical information, obtaining equipment and supplies at reasonable prices, and developing markets were among the main barriers faced by processors and potential processors.

The "Making it in the Northeast: Small-Scale Food Processing on the Rise" conference, held in Syracuse, NY, in January, 1997,

attracted more than 235 participants. Processors and potential processors from New York State were joined by extension agents, government personnel, and small business development organization staff from New York and several other states. The workshops focused on marketing, processing technical information, and business management.

Based on interest expressed by conference participants, a working group of volunteers from the conference has discussed different approaches to serving the needs of small-scale processors including training, product development facilities, advertising, product distribution, supply purchases, educating consumers, and obtaining group insurance. Currently it is working on a state-wide organization with regional chapters to encourage networking among processors and build on regional identities established for promoting tourism within the state.

We are developing policy recommendations, encouraging food processing incubators, and working to create a mentoring program in which new entrants into processing are paired with experienced processors. We are collaborating with the Pennsylvania Association for Sustainable Agriculture in workshops and developing information that will aid current and prospective processors.

To date we have constructed a database of more than 5,000 farmers and other entrepreneurs starting and operating small-scale food processing businesses in NY. We have grouped processors by product category, production site (home, farm, nonfarm plant), and whether they are certified organic. We are developing case studies of several processors and food processing incubators (FPIs). FPIs, which support small processors, are growing in number throughout the US.

Reported December 1997.

Project Number

LNE95-63

cost is the wage paid to the farm operator. A number of operators were not paid a competitive wage for the hours spent working at the CSA. The average share price from the 1996 survey was about \$460. It was estimated CSA share prices should be about \$120 higher on average in order to pay operators a competitive wage. In addition, costs associated with fixed inputs, especially land and capital costs, may not be fully included in share *prices*. This is an important issue that we will consider during the remainder of the project.

At the same time, the research indicates that retail values for comparable amounts of organic produce were as much as double the CSA share prices. At one CSA farm, a \$450 share netted 700 pounds of produce valued at \$1,130. The magnitude of savings are smaller when comparing the CSA share cost to the retail value of conventional produce, but they are still significant. These results provide evidence that CSA operators should be able to cover full costs of production.

Outreach has included publication of the *1996 CSA Farm Network* which was distributed to about 1600 individuals and organizations. The *CSA Farm Network* provides a comprehensive list of Northeast CSA operations, a list of resources of value to CSAs and numerous articles on production and marketing practices for CSA operations. The *1997 CSA Farm Network* is now available.

The project provided direct contact with CSA operations through peer-mentoring workshops, telephone consultations and the Northeast CSA Conference. It also created a comprehensive resource list and on-line

services for CSA farmers and members.

CSA: Building A Future for Farming in the Northeast, was held November 7-8, 1997 in western Massachusetts. The planning committee organized the 39 workshops to maximize discussion that would allow for peer mentoring and trouble shooting.

More than one-half of the 320 participants were CSA growers or current farmers thinking of moving in the direction of CSA. Attendees included university, USDA and extension personnel. All states in the northeast region were represented as well as Alaska, Florida, Minnesota, Montana, California, Washington, Oregon, Ohio, Tennessee, Michigan, Illinois, Wisconsin, and Ontario, Canada. The response was so overwhelming that the planning committee turned away over 150 people because of site limitations.

In written evaluations, people loved the sole focus on CSA rather than including other farming issues. For many, the conference was, as one woman put it, "confirmation of our experience that there is tremendous variation among CSA farms, rather than one *true ideal*." Most participants highlighted a strong sense of being part of a larger CSA movement through their attendance at the conference and felt the potential for a supportive network. Audio tapes of all workshops are available.

Robyn Van En, a primary collaborator in this project, co-founder of CSA of North America and long-standing advocate of community supported agriculture, died January 8, 1997. The conference was dedicated to her memory.

Reported December 1997.

CORE Values Northeast: A Northeast IPM-Apple Consumer Education and Market Development Project

Marketing

Summary

A collaborative effort between apple growers, land grant university researchers and extension specialists, apple industry representatives and consumer advocates, this project will use consumer education and market incentives to boost demand for local, ecologically grown apples and to encourage grower adoption of ecological farming methods.

Objectives

1. Increase public appreciation for agricultural practices, adapted to local circumstances, which provide quality products and contribute to the preservation of traditional rural landscapes.
2. Promote market development of ecologically grown apples produced in the Northeast and positively influence consumers' preference for them.
3. Reward regional producers in the program by increasing their market share and/or returning preferential prices.
4. Encourage growers' adoption of ecological practices by demonstrating consumer demand and increased market share for ecologically grown apples.

Abstract

The Northeast Stewardship Alliance (NESA): Communities Organized in Respect for the Environment (CORE) was assembled beginning in July, 1995, under the leadership of progressive growers with applied expertise in integrated pest management (IPM) and the consumer advocacy organization, Mothers & Others for a Livable Planet. NESA includes IPM extension specialists from each Northeastern college of agriculture, apple-IPM research scientists who address the full spectrum of apple pests, representatives from state departments of agriculture, and apple industry representatives.

NESA developed CORE Values Northeast, a special project which utilizes consumer education and market incentives to boost demand for local, ecologically-grown apples and to encourage grower adoption of ecological farming methods.

Over a three-year project period which began in early 1996, NESA will implement and evaluate the following:

1. The Partnership Component, in which we develop a sense of trust among the group and commitment to common goals;
2. The Supply Component, in which we develop and implement a system to identify and distribute Northeast ecologically-grown apples; and
3. The Consumer Education and Market Development Component, in which we create and implement an educational strategy and build a network of buyers.

By increasing consumer demand for ecologically grown apples through education, and allowing recognition of ecologically-grown apples through labeling, this

Coordinator

Wendy Gordon
Mothers and Others
40 W. 20th St.
New York, NY 10014

Phone: 212-242-0010

Fax: 212-242-0545

Email: wgordon@igc.apc.org

Collaborators

Mothers and Others
Tufts University
Northeast McIntosh Growers
Association
Massachusetts Department of
Food and Agriculture
University of Massachusetts
Extension System
Bread and Circus
D'Agostino Supermarkets
apple growers from
Massachusetts, Connecticut,
New York, Vermont and New
Hampshire.

Duration: 1997-1998

SARE Grant: \$20,000

Match: \$82,500

Project Number

LNE97-88

Project Number
LNE97-88

project is likely to result in increased market share and better prices for ecologically grown apples and increased interest in adoption of standardized ecological methods by orchardists.

If CORE Values Northeast is successful, it will lead to greater economic viability of the

Northeast apple industry, greater use of ecologically based orchard-management practices, and environmental and social benefits accruing from stronger markets for northeastern apples.

Approved for funding March 1997.

Ethnic Markets & Sustainable Agriculture

Marketing

Summary

This participatory action research project aims to help northeast producers profitably tap into the region's ethnic food markets. The project will explore the demand for ethnic products that can be produced in the Northeast, determine the potential to expand the production of these items, develop new marketing relationships, and create a publication documenting the approach and experiences.

Objectives

1. Test and demonstrate a methodology, based on the principles of participatory action research (PAR) for identifying and characterizing specific ethnic marketing opportunities in urban communities that have significant potential to enhance the profitability of farms in the Northeast region.
2. Implement two to three pilot marketing projects to test and demonstrate the ability of Cooperative Extension and NGO's to facilitate successful marketing relationships linking northeast farmers to ethnic markets.
3. Support the replication of this type of market research and development in other northeast communities by publishing a guide which outlines the PAR process used, results achieved, and experiences of participants over the course of the two-year project.

Abstract

Farmers, the Extension Service, and other agencies and organizations are looking for innovative marketing opportunities to help sustain agriculture in the Northeast US. There has been a great deal of discussion about "tapping ethnic markets," but very little actual development work on this topic. Urban ethnic markets present a significant opportunity for farmers in the Northeast.

The Boston to Washington megalopolis contains some of the highest concentrations of ethnic immigrants anywhere in the world. These ethnic groups tend to form close-knit communities with strong cultural ties to their homeland. Food is integral to sustaining ethnic cultures. Some ethnic groups also use food businesses (e.g., restaurants and retail grocery stores) as tools to support their communities economically. Ethnic products range from Oriental, Italian and Hispanic vegetables and specialty herbs, to goat meat, full-fat dairy products, and live poultry. We believe that many of these products can be produced profitably by farmers in the Northeast. Bridging the cultural gaps between consumer and producer is both a key challenge and opportunity.

Just Food (a non-governmental organization based in New York City), in cooperation with the Farming Alternatives Program at Cornell University and Cornell Cooperative Extension of New York City, propose a participatory action research (PAR) project that will help access the vast but complex ethnic food industry in

Coordinator

Kathy Lawrence
Just Food
NYC Sustainable Food System
Alliance
290 Riverside Drive
Suite 15D
New York, NY 10025

Phone: 212-666-2168
Fax: 212-666-2168
Email: klawrence@igc.org

Collaborators

Farming Alternative Program
Coop Extension of NYC
Siembra Project

SARE Grant

\$99,961

Match

\$12,180

Duration

1988 to 1999

Project Number

LNE97-94

Project Number

LNE97-94

New York City. This effort will serve as a model for other northeastern communities with culturally diverse populations.

This two-year project will include four components: 1) market research to explore the demand for ethnic agricultural products that can be produced by Northeast farmers; 2) producer research to determine the potential to expand the production of ethnic

products; 3) pilot projects to create new marketing relationships which link producers in the region with potentially profitable ethnic markets; and 4) a publication; to outline our approach, strategies and experience in linking farmers to urban ethnic markets, and our recommendations for other efforts around the region.

Approved for funding March 1997.

Chinese Medicinal Herbs as Crops for the Northeast

Marketing

Summary

Participants will examine the growth and productivity and medicinal qualities of several Chinese medicinal herbs at several locations in the Northeast, with the goal of determining whether the plants could be successfully and profitably produced and marketed by Northeastern growers. Grower and herbalist participants will also to explore a community-based, cooperative marketing and education system.

Objectives

1. Evaluate the probable productivity of Chinese medicinal herbs in the Northeast under organic-farming conditions.
2. Explore a community-based, cooperative program of growers and herbalists interested in production and marketing of Chinese medicinal herbs.

Abstract

Production of specialty crops which sell at premium prices could mean significant increases in income to Northeastern growers. We propose that Chinese medicinal herbs are such a specialty crop and that with some investigations on field production and cooperative efforts of growers and herbalists these plants could be produced in the Northeast. Alternative medicines, such as the use of Chinese medicinal herbs are gaining in popularity in the United States. Yet, all the plant material used must be imported from China and is of questionable quality. Herbalists in centered in New York City indicate a need for a U.S. based source of plant materials.

This study will examine the growth and productivity of several Chinese medicinal herbs at several locations in the Northeast. The plants would be evaluated by an herbalist for quality characteristics expected in such plant material as compared with that currently on the market. Records on growth, production, quality, and costs would be maintained to determine if the plants could be successfully and profitably produced by Northeastern growers. In addition, the study will bring together growers and herbalists to explore a community-based, cooperative marketing and education system. Such a system would focus direct interaction between producers and users for communication about problems and needs. Growers and herbalists would see the plant material being grown at annual workshops and have opportunity to meet with each other. Such contacts should lead to agreements for production and sale of Chinese medicinal herbs grown in the Northeast.

Approved for funding March 1997.

Coordinator

Lyle Craker
University of Massachusetts
Department of Plant Science
Amherst, MA 01003

Phone: 413-545-2347

Fax: 413-545-3958

Email:

Craker@pssci.umass.edu

Collaborators

High Falls Gardens
Entwood Farm & Nursery
Stow Fence Farm
Cricket Hill Garden
University of Massachusetts

Duration

1998-2000

Grant

\$60,716

Match

\$30,750

Project Number

LNE97-92

Development of Fungal Entomopathogens for Greenhouse IPM

Summary

This three-state research and education initiative aims to encourage greenhouse growers to use IPM, including biological controls such as insect-killing fungi, for production of greenhouse ornamentals.

Accomplishments to date include:

- The Tri-State IPM Advisory Committee was established in 1995 with grower, researcher and extension representatives from Maine, New Hampshire and Vermont to educate growers about IPM techniques in greenhouse production.
- The committee conducted a survey in 1996, the results of which were used to develop a strategy for IPM education that is now being implemented. One workshop has already been held and two more are planned for 1998.
- Preliminary laboratory tests suggest that fungal preparations are compatible with a variety of greenhouse beneficial organisms.
- Plant growth regulators and biorational insecticides that are used in greenhouse production are commonly compatible with the use of fungal insecticides.
- Some older insecticides were incompatible with fungal insecticides. Fungicides were the most inhibitory to the effectiveness of fungal insecticides.

Objectives

1. Establish a regional IPM Advisory Committee comprised of growers.
2. Initiate a three-year demonstration scouting program and Tri-state training workshops.
3. Assess compatibility of fungi with beneficials and biorational pesticides.

Method and Findings

Use of IPM is increasingly being advocated for ornamentals production. Presently, however, IPM is not widely practiced by growers in northern New England. Reasons for this include a general lack of knowledge of IPM techniques and a lack of opportunities to acquire an understanding of the techniques and necessary skills required to develop and implement an IPM program. Our goals have been to develop ways of increasing growers' awareness of IPM practices by providing grower-oriented, hands-on educational workshops on some of the basic "how to's" of IPM and to conduct research to address the integration of mycoinsecticides with other control tactics.

The Tri-State Advisory Committee, established in 1995, has met several times to discuss strategies for increasing IPM implementation in Maine, New Hampshire and Vermont. The first workshop proved very successful. Many of the

Ornamentals

Coordinators

Michael Brownbridge, Bruce
Parker & Margaret Skinner
Entomology Research Lab
PO Box 53400
Burlington, VT 05405-3400

Phone: 802-656-5400

Fax: 802-658-7710

Email: mskinner@zoo.uvm.edu

Collaborators

Cornell University
Mycotech Inc., Butte, MT
New York IPM Program
University of Maine & Maine
Extension System
University of Massachusetts &
Mass. Extension System
University of New Hampshire
& NH Extension System
University of Vermont and
Vermont Extension System
Vermont Association of
Professional Horticulturalists

SARE/ACE Grants: \$231,931

Match: \$155,808

Duration: 1996-1999

Project numbers:

ANE95-23, LNE95-58



Project numbers:

ANE95-23

LNE95-58

growers who attended had never seen what an infected or parasitized insect looked like or the different life stages of the common pests or beneficials.

One grower had said prior to the workshop that he never had thrips problems. Within one month of the workshop, he called to say he had a severe thrips problem and needed help developing a management strategy. He admitted that if he had not gone to the workshop, he would never have known they were thrips.

The committee is planning more workshops and a seminar in 1998 on the "Practical Application of Natural Enemies in Greenhouse IPM."

Fungi are not a "silver bullet" solution to all pest problems and will be most effectively utilized within an IPM program. Use with other IPM "basics" such as scouting will be essential for growers to decide on the optimal time to apply pest management techniques. In order to rationally utilize fungi in an IPM program, growers need information on the compatibility of fungi with chemicals and natural enemies used in greenhouse crop management. This sort of information is critical to facilitate the timely use of pesticide sprays or release of beneficials which will minimize any potentially negative inter-

actions and maximize control effects.

In general, results of our in vitro trials suggest a high degree of compatibility between fungi and plant growth regulators and biorational insecticides (IGRs, soap, etc.); predictably, fungicides were the most inhibitory.

Commercial, fungal products are formulated with materials such as emulsifiable oils, clays and other adjuvants, which are known to be toxic or repellant to certain beneficials. Current research is assessing the effects of commercially formulated myco-insecticides, focusing on survival of parasites in scales which are subsequently treated with fungi, and on parasitization rates when leaves have been treated with fungi prior to the parasitoids' release. These trials, which are being carried out on poinsettia, will provide necessary practical information on the concurrent use of these two biocontrol agents. Results will be presented in the next report.

The different project components will serve to advance alternative approaches to pest management in ornamental crops, providing growers with the necessary tools to begin to use IPM techniques with confidence.

Reported December 1997.

Flowering Plants to Enhance Biological Control in Landscapes

Summary

Using biological insect pest control strategies, participants will investigate ways to enhance beneficial insect populations through strategic plantings of flowering plants in urban landscapes. The study will focus on predators and parasites of the azalea lace bug. Their goal is to develop alternative, reduced-insecticide pest management methods that are practical, economical, and aesthetically pleasing.

Objectives

1. To identify which flowering plants are favored by green lacewing, a generalist predator, and a specialist ichneuemonid parasitoid, *Lathrolestes nigricollis*.
2. To evaluate the effect of incorporating flowering plants (identified in objective 1) into landscapes on beneficial insect and herbivore population dynamics.
3. To produce educational tools (interpretive landscape displays, slide series, and a fact sheet) to educate landscape practitioners and educators on the concepts and benefits of incorporating certain flowering plants into landscapes to enhance biological control.

Abstract

Pest suppression is enhanced by incorporating flowers, which promote predator and parasitoid abundance, into agroecosystems. However, information about which flowers are best suited for promoting the abundance of particular beneficial insects is limited.

Our first goal is to identify the types of flowers that will promote beneficial insect abundance in urban landscapes through laboratory evaluations of predator and parasitoid foraging performance on groups of flowers encompassing a range of disparate floral architectures (the spatial relationship of the nectary with other floral parts). We will focus on the green lacewing (*Chrysoperla carnea*), a key predator of the azalea lace bug, and *Lathrolestes nigricollis*, an ichneuemonid wasp that parasitizes the birch leafminer. Preliminary laboratory evaluations demonstrated that flowers, especially those with exposed nectaries, could function as "suitable" floral hosts for green lacewing and parasitoid wasps.

Our second goal is to evaluate the impact of incorporating "suitable" flowering plants into landscapes (with azalea lace bug and birch leafminer infestations) on beneficial insect and pest population dynamics. Studies in experimental fields interplanted with laboratory-selected flowers indicated that their presence significantly increased predator abundance and insect pest mortality.

Thus, our overall goal is to use laboratory evaluations of green lacewing and *L. nigricollis* foraging performance on flowers to select species of flowers that, when interplanted within landscapes, will greatly increase these beneficial insects'

Ornamentals

Coordinator

Paula Shrewsbury
Rutgers University
Dept. of Entomology
JB Smith Hall
New Brunswick, NJ 08903

Phone: 908-932-9324

Fax: 908-932-7229

Email:

shrewsbury@aesop.rutgers.edu

Collaborators

University of Rhode Island
The Brickman Group, LTD
RI Nurserymens Assoc
NJ Dept of Agriculture
Garden State Parkway
Authority
Cornflower Farms
Ricon-Vitova

SARE Grant

\$80,344

Match

\$89,488

Duration

1998 to 1999

Project Number

LNE97-95



Project Number
LNE97-95

abundance with a concomitant increase in the mortality of azalea lace bug and birch leafminer. The success of this project will allow us to extend, through educational outreach, an alternative method of pest management (conservation of beneficials) that is practical, economical, aesthetically pleasing, and results in reduced pesticide input and the creation of sustainable landscapes. We hope that this system will serve as model for managing other key pests in urban landscapes.

Approved for funding March 1997.

New England Sustainable Agriculture Extension Training Project

Summary

The long-term goal of the New England training project is to increase the ability of the extension system and other federal and state agencies (Natural Resources Conservation Service/NRCS, Farm Services Agency/FSA, state departments of agriculture) and farmers in the six New England states to develop and maintain sustainable agriculture, protect the natural environment, and strengthen rural communities. Specific objectives to meet this goal are to:

Objectives

1. Establish more effective networks among farmers, extension and other agency personnel for teaching, and planning and conducting research;
2. Increase knowledge about sustainable agriculture and about specific sustainable farming techniques and whole farm systems analysis;
3. Identify information needs of farmers in New England and develop educational materials and further training and educational programs; and
4. Develop skills to address complex community issues relating to agriculture and to increase awareness among community members about the importance of maintaining New England's agricultural base.

Results to Date

This project was funded as a continuation of a New England-wide effort which began in spring 1994. A regional planning committee had been organized to conceptualize the project, which included representatives from the six New England Extension Systems and from sustainable farming organizations. The committee spent over a year planning a regional conference, including a pre-conference training for study circle facilitators. The conference took place in March of 1995 and more than 250 attended, among them Extension, NRCS, and other agency personnel and farmers. Follow-up activities included two sub-regional training workshops on whole farm planning and decision-making.

From the beginning, the project's focus has been twofold: a) increasing the level of understanding among agency personnel about sustainable production techniques; and b) acquiring participatory learning and research skills so that agencies and farmers can work more cooperatively together. The committee believes that for extension and other agencies to meaningfully promote sustainable agriculture, there must be increased understanding of the concept of agriculture as a complex biological, economic and social system. Staff members of these publicly funded agencies need to be working with farmers as co-learners and as agents of change. Establishing participatory, co-learning partnerships with farmers who have adopted sustainable systems is one way of addressing this challenge.

Professional Development

Coordinator

Kate Duesterberg
Center For Sustainable
Agriculture
University of Vermont
Burlington, VT 05405

Phone: 802-656-0037

Email: kduester@zoo.uvm.edu

Collaborators

University of Vermont
University of Massachusetts
University of Connecticut
University of New Hampshire
University of Rhode Island
University of Maine
New England Cooperative
Extension Consortium
Maine Organic Farmers and
Gardeners Association
Northeast Organic Farming
Association chapters

SARE Grant

\$119,613

Duration

1995-1998

Project number

ENE95-8



Project number

ENE95-8

Over the past year and a half, the project has organized three regional farm tours and one New England-wide training on Participatory Research & Education and has developed several fact sheets intended for regional audiences.

Reported December 1997.

Education of Extension Workers in Sustainable Agriculture Practices Utilizing The PASA Conference

Key Findings

Extension workers are much better informed about sustainable farming practices after attending the 1996 and 1997 Pennsylvania Association for Sustainable Agriculture (PASA) conferences and participating in two tours which highlighted sustainable agriculture production in the Mid-Atlantic region. These forums promoted discussion between farmers, extension workers, and the Natural Resources Conservation Service (NRCS) personnel about economic and environmental trade-offs as well as the underlying principles of farmer practices. Agents are incorporating this knowledge in their programming and increasingly target sustainable agriculture as a planning objective.

Objectives

1. Further the understanding of Pennsylvania extension workers about sustainable farming practices.
2. Provide extension workers with first-hand observations and discussion of sustainable practices implemented in Pennsylvania.

Project Activities and Results

This project promoted the attendance and participation of county agents at the annual Pennsylvania Association for Sustainable Agriculture (PASA) conference and hosted two tours which highlighted sustainable agriculture production in the Mid-Atlantic region.

The PASA conference was well attended in both 1996 and 1997 by extension workers. In 1996, 41 Pennsylvania State University (PSU) extension workers attended the PASA conference and 30 PSU extension workers attended in 1997. Funds were provided for travel and lodging.

The first of the two tours focused on sustainable fruit production and included sessions on sustainable production research which is being conducted at the Penn State Research and Extension Center, and on-farm discussions and tours with two fruit growers on the impact that production and marketing have on sustaining fruit production in the area. The second tour highlighted sustainable dairy and agronomic farming and included visits with Lancaster County farmers and to Rodale's soil research plots.

Participants had the opportunity to visit research sites and farms where sustainable agriculture practices are being implemented. They learned about the technical aspects and had access to information and discussion on the practicality and productivity of these practices. Participants observed first-hand the soil health, crop vitality, livestock health, pest pressure levels, and farm family's economic well-being. The farm visits continued the co-learning model

Professional Development

Coordinator

James Travis
Pennsylvania State University
219 Buckhout Laboratory
University Park, PA 16802-4507

Phone: 814-865-3761
Fax: 814-863-7217
Email: JWT2@psu.edu

Collaborators

Pennsylvania Association for Sustainable Agriculture
Pennsylvania State University
Rodale Institute

SARE Grant

\$35,000

Match

\$19,778

Duration

September 1995 to August 1997

Project Number

ENE95-10



among extension workers and farmers by focusing on real-world examples.

In this forum, the economic and environmental trade-offs of particular practices and their long-term sustainability were discussed. We also explored the underlying principles of the farmer practices and the transferability of these practices to other farms. We visited selected farms to see different levels of implementing sustainable agriculture practices. The range of farms illustrated the transition process toward a more sustainable farming and food system from initial steps in sustainability to organic production.

Farmers discussed select practices on an individual level and then related them to the whole farm system. By focusing on individual components, such as the use of cover crops, participants learned first hand how a farmer manages a particular practice. On the other hand, discussions about the whole farm system, such as a dairy farm that produces crops without chemicals, composts manure and relies on rotational grazing, illustrated the synergy that individual components create.

The tours portion of this project involved 44 extension workers from six states. Participants included 24 extension workers from Pennsylvania, six from Maryland, four from New York, three from New Jersey, and one from New Hampshire and Rhode Island. Participants also included six NRCS staff, seven farmers, and two state government employees.

One of the main objectives of this project was to make sustainable agriculture practices a part of extension planning. There are cur-

rently 26 Plans of Work at PSU which target sustainable agriculture as an objective.

Survey Results

A survey was sent out within a few weeks of the final tour. Participants were asked if the things they had learned on the tours will be useful to them in their programming. Some responses follow.

"One small organic farm is using piglets to root around his compost. I've become more aware of manure management."

"Being a fruit grower most of my life, without livestock crops, everything was new and different. Surely the need is there to keep our soil in the best condition so our farmland doesn't turn into desert."

"Working on a winter meeting to present issues to help NJ and area dairymen make the transition to sustainable/organic dairying."

"Pasture alley improvement."

"Discussed Groff farm activities with fellow agent dealing with this client group. Will use information during fall and winter meeting including web site. Great!"

"Developing a program on production of organic dairy products."

"I've recommended use of a rotary hoe as a weed management tool as demonstrated at Weavers. I also used some of the rotational grazing information from Enos Hoover in a presentation on rotational grazing."

"Working with no-till vegetable transplanter demonstration plots on research farm and producers' farm."

Reported December 1997

On-Farm Research and Extension Education Program

Professional Development

Summary

This program trained extension agents, farmers, and conservation district field staff in skills needed to investigate the use of new practices in agriculture. During the two-year project, 135 Pennsylvania extension agents and other agency field personnel were trained in reliable experimental techniques for on-farm research.

Key Findings

Extension agents who participated in the training more than doubled the number of on-farm trials they were involved with in the two years following the training compared to the number they conducted prior to the training.

New ideas for on-farm experimentation included a pair-wise comparison of paddocks in a pasture study and the testing of farm compost as potting media in a commercial greenhouse nursery study.

Objectives

1. Instruct Pennsylvania State University Cooperative Extension agricultural agents and USDA personnel to plan and conduct on-farm demonstrations and research.
2. Extension agents will collaborate with farmers to plan on-farm trials, conduct trials, interpret the results, and disseminate the knowledge gained.
3. Evaluate methods used and develop reference materials.

Project Activities and Results

Forty-three extension agents across the state's five extension regions were trained in reliable experimental techniques for on-farm research, thirty-nine percent of Pennsylvania's agricultural agents, surpassing the project's original goal of reaching one-third. Training was usually conducted in small groups of three and four agents at central county office locations.

In September 1996, 92 agency field staff (consisting primarily of conservation district managers and technicians) along with a few NRCS staff and state land resource personnel received on-farm demonstration and research training. The project coordinator was the main presenter at six of their regional quarterly training meetings.

One unexpected result from the agent training sessions was a desire for knowledge of demonstrations and research projects being conducted by other agents within the state. Participants often noted that they didn't even know what agents in adjacent counties were doing. As a result, the coordinator

Coordinator

Phil E. Rzewnicki
Penn State University
Extension
PO Box 449 Highland Hall
Annex
Hollidaysburg, PA 16648

Phone: 614-292-0117
Fax: 614-292-3505
E-mail: przewnicki@
agvax2.ag.ohiostate.edu

Collaborators

Pennsylvania State University
Pennsylvania Association for
Sustainable Agriculture
USDA Natural Resources
Conservation Service

Duration

January 1996 to December
1997

SARE Grant

\$90,373

Match

\$34,660

Project Number

ENE-95-11

compiled a booklet including reports of demonstrations being conducted by all agents, whether or not they were participating in this project.

Another unexpected result of the project was an invitation by Ohio State University Extension agents and the Innovative Farmers of Ohio to conduct training sessions at two on-farm research workshops. This was a direct result of an Ohio staff person who attended an agent training session conducted by the project coordinator at the 1996 Annual Meeting of the Pennsylvania Association for Sustainable Agriculture.

During the course of the project, ten farmers, one agricultural service owner, and one commercial nursery collaborated with extension agents in the planning and implementation of on-farm experiments as a direct result of agent training. A few participated in the collection and interpretation of data. Two producers participated in the dissemination of results to others.

Two new ideas initiated by the project included a pair-wise comparison of paddocks in a pasture study and the testing of farm compost as potting media in a commercial greenhouse nursery study.

The pasture study using pair-wise comparison of paddocks resulted in a high coefficient of variation, indicating the that experimental method needed to be improved. The rising plate method used to measure dry matter availability may be too variable. Further study is needed with an alternative measure (such as grass clippings) to determine available forage.

The greenhouse study resulted in a workshop sponsored by the Montgomery County extension agents. The agents developed a booklet using county funds to explain the

techniques they used. Workshop participants could use this information to duplicate efforts on their own.

All other methods used were based on current literature. Copies of existing materials were provided to participating agents for future application of skills learned.

Potential Contributions and Practical Applications

The 43 extension educators who received training in on-farm experimental design through the project were surveyed at its conclusion. Thirty percent (13 agents) returned the survey. Responses indicated the following:

Eleven agents (85 percent of the respondents) indicated they were involved with 44 on-farm research projects during 1996 and/or 1997. During the two years prior to the project (1994 and 1995), these same agents were involved with only 18 on-farm trials.

Respondents reported being moderately influenced by the training to increase the involvement of cooperating producers in the planning, implementation and analysis of the demonstrations or trials.

Nine out of 11 who reported conducting on-farm trials in 1996/97 said they were better able to design experiments with producers as a result of the training. The skills they reported applying were randomization, replication, proper plot size, and statistical analysis.

- Participant comments suggest that while they are highly interested in doing more on-farm research trials, they perceive on-farm trials to be time consuming and somewhat difficult to manage. Additionally, agents said they would like support from university specialists in these endeavors.

The potential impact on the producers involved and the environment can be illustrated by the individual trials conducted as a result of agents implementing new skills:

- Effects of starter fertilizer and/or additives for corn production on fields receiving dairy manure. None found in trials on four farms.
- Comparison of sorghum silage and corn silage yields. Corn silage much better when precipitation is normal.
- Vegetable variety trials. Father and son potato farmers who wanted to diversify were able to select vegetable varieties after two years of trials.
- Compost container media trial on landscape nursery plants. Greenhouse business in urban area able to use farmer compost as a potting medium.
- Soil aeration of permanent pasture using the Aerway machine. No significant pasture improvement found. Further testing needed to investigate effects of timing of aeration and dry matter measurements.
- Corn silage variety performance trials. Dairy farmer able to select silage varieties for yield performance and forage quality.
- Application of composted waste from packing plant to fertilize a pasture. Began at end of project, results yet to be determined.
- Pasture irrigation using milk house wastewater. Began at end of project, results yet to be determined.
- Investigate various calcium sources and applications for potatoes in a calcium deficient soil. Began at end of project, results yet to be determined.

Recommendations

Training/education needs beyond the scope of this project would be to train an extension staff person to remain as a resource specialist to support agents and clientele in the development, design and analysis of on-farm trials. Also, this person or another staff person should be given the responsibility of gathering and publishing reports of demonstrations and on-farm research being conducted by agents across the state.

Recommended changes to the procedures used in this project would be to assess the attitudes of state extension specialists regarding their support of on-farm research at the program proposal stage. Also, if collaboration with state grower associations is needed, up to one year prior to planned activities is needed to incorporate change into routine agendas.

Future educational programs in this area should probably assess staffing patterns of a state's extension system. If there has been a severe cutback in agricultural agent positions, the interest for on-farm research may be very high, but the capacity to actually implement new programming may be limited.

Reported December 1997

Project Number

ENE-95-11

Sustaining Agriculture In Northeast Communities: New Roles, New Skills for Agricultural Educators

Professional Development

Summary

The purpose of this two-year project was to provide extension personnel, USDA agency field staff and others with educational programs, resource materials, and ongoing support to help them work with diverse farm and non-farm audiences to become more effective leaders of local community-based agriculture development efforts. Such efforts include addressing local "agricultural illiteracy;" helping farmers and non-farmers work together to address water quality issues; promoting institutional purchases of local farm products; organizing farmers markets or marketing co-operatives; promoting local agritourism; farmer-to-farmer learning networks; improving farmer-neighbor relations; and identifying new marketing opportunities.

This project has had a major impact in changing peoples' thinking about the kinds of approaches needed to sustain agriculture in the Northeast. The term "agriculture development" was rarely heard at the beginning of this project. It is now one of the hot issues in most county extension offices in New York.

Follow-up telephone surveys show that participants are using the information and understanding they acquired at the trainings to advance their local goals.

Community agriculture development models and strategies are adopted by communities as a result of our workshops, study tours, newsletter or other networking channels. Some examples: Howard County appointed an Agricultural Development Council and Orange and Wayne Counties hired agricultural development specialist based on models presented in our workshops; extension agents in St. Lawrence and Franklin Counties began a farmer recruitment program based on workshop models. Dutchess County has documented a 45 percent increase in direct marketing sales over the last several years due to the innovative agriculture development efforts of Cooperative Extension and other partners.

Objectives

The major educational objectives were to provide Cooperative Extension, USDA agency field staff, and other "multipliers" with resource materials, training, and assistance in:

Coordinators

Thomas Lyson and Judy Green
Farming Alternatives Program
Rural Sociology Department
Cornell University
Ithaca, NY 14853-7801

Phone: 607-255-1684

Fax: 607-254-2896

Email: tal2@cornell.edu

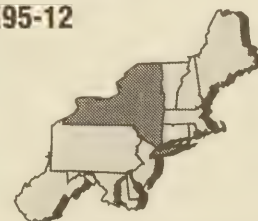
Collaborators

Cornell Cooperative Extension
Community Dispute Resolution
Center of Tompkins County
South Central NY Resource
Conservation and
Development Council
Montgomery County Soil and
Water Conservation District
Just Food
La Siembra Project
Mohawk Valley Sustainable
Farmers Network
Rochester Foodlink
NYSAWG
(See list at end of report for
more participants.)

SARE Grant: \$121,732

Duration: 1995-1997

Project Number
ENE95-12



1. Organizing and facilitating community-level dialogue and, where needed, mediating conflicts about agricultural issues among people with diverse perspectives and interests in the community.
2. Facilitating community-level strategic planning and development projects to sustain local farming.

Approach and Methods

The two year project included the following activities.

1. Two annual “Farming For the Future” leadership workshops to build participant skills and knowledge for successful community-based dialogue, strategic planning and agriculture development projects. The workshops included three types of sessions: group process skills-building sessions; focus sessions on particular agriculture development topics; and team project planning sessions. Approximately 100 people attended each event, 80 percent of them registering as teams of partners from a local or regional community. An extensive Resource Notebook was compiled for workshop participants, with over 400 pages of materials provided in thirteen different content areas.
2. Two study tours for participants to learn firsthand about innovative community agriculture development strategies. In the fall of 1996, more than a hundred participants attended two study tours contrasting two community agriculture development strategies in two very different contexts: Dutchess County and Jefferson County, New York.
3. Ongoing outreach, networking and direct assistance to help participants put training into practice. After the 1996 workshop,

project staff began providing follow-up support to a number of community-based teams and to a statewide working group which was organized to continue the net-working process.

4. Production of printed resource materials to reach a wider, national audience. Workshop resource materials were updated, expanded, and made available to a national audience either as a complete Resource Notebook (400+ pages) or as separate topical resource packets. A final comprehensive bulletin, tentatively entitled “Farming For the Future: A Guide to Sustaining Agriculture in Your Community,” is soon to be published.

All of these activities were designed to help participants gain skills and knowledge for increased effectiveness in:

- Organizing and facilitating community-level dialogue and, where needed, mediating conflicts about agricultural issues among people with diverse perspectives and interests (objective 1).
- Facilitating community-level strategic planning and development projects to sustain local farming (objective 2).

In addition, project activities fostered an interactive network of participants who could continue to learn from each others’ experiences in the field.

Project Participants

The primary target audience for this project was Cooperative Extension field staff and other USDA agency staff who work directly with farmers. In addition, since by definition community agriculture development brings together diverse stakeholders, this project was designed to engage farmers themselves and a wide variety of potential

leaders, including members of community development groups, planning boards, watershed protection organizations, County Agriculture and Farmland Protection Boards, agribusiness, Soil and Water Conservation Districts, environmental groups and agencies, and interested individuals. Our focus was primarily on New York State and secondarily the Northeast region, however many participants in the second leadership workshop came from outside the region.

The project was quite successful in attracting an appropriate diversity of participants. This diversity was one of the most important and valuable features of project activities, as it allowed participants to directly experience and benefit from diverse perspectives and knowledge and reflected the same variety of stakeholder groups they are likely to have to work with back in their own communities.

The high level of participation of Cooperative Extension staff is noteworthy. Previous annual conferences organized by the Farming Alternatives Program had never been so successful in attracting extension personnel. We believe our success this time was due to several factors:

- a high level of interest in agriculture development at the local level (the right issue at the right time);
- Cornell Cooperative Extension administration's direct sponsorship of the project, which included help in publicizing and encouraging field staff to participate (the right partners with the right connections and leverage);
- increasing acceptance of "sustainable agriculture" and organizations identified with it, including the Farming Alternatives Program, by "mainstream" agriculture groups such as extension.

Recommendations

There is a continuing need to share information about successful and unsuccessful agricultural development strategies among all of these groups through workshops, study tours, electronic media, extension and agricultural media, publications etc. The process of building skills, knowledge and experience needs to continue, both to strengthen the effectiveness of current project participants and to reach greater numbers of individuals and communities.

Research is much needed to evaluate which strategies are effective in actually stabilizing and sustaining agriculture as an economically viable, environmentally enhancing and socially-enriching component of northeast communities. As a first step, "sustainability indicators" for agriculture need to be established, on the local level and by the state or region. Data need to be collected or at least assembled from a variety of sources to establish benchmarks for measuring progress towards or away from sustainability. This would require a combined research/professional development effort to identify these indicators and put them into practice.

Another need is to help extension educators be more effective in providing marketing assistance to local producers. There are a variety of roles that can be played, including researching marketing opportunities; connecting farmers with wholesale buyers; educating consumers; helping to organize marketing initiatives such as cooperatives; facilitating other agency involvement; and nurturing new marketing enterprises.

Project Number

ENE95-12

Project Number

ENE95-12

Other Participants

Jefferson County Industrial Development Agency, New York State Department of Agriculture and Markets, New York State Assembly Subcommittee on Food, Farm & Nutrition Policy, Franklin Associates, Seaway Trails Inc., Howard County (Maryland) Economic Development Agency, Lancaster County (Pennsylvania) Chamber of Commerce, NY Rural Development Council.

Reported December 1997.

Whole Farm/Whole Watershed Planning for Sustainable Agriculture

Summary

A conference, case studies, and follow-up meetings provided the framework for this New Hampshire project. Extension and NRCS field staff, working together, learned to develop solutions to problems using case studies that allowed them to consider the farm ecosystem and the whole watershed.

Key Results

Coordination with other professionals, discussions with land-users on sustainable agriculture practices and other professional development activities pertaining to whole farm/whole watershed planning greatly improved as a result of this project. However, there is a need to broaden professional knowledge about a wide range of issues in order to better help the producers.

The dissemination of the information learned through this project will be an ongoing activity as the participants work with farmer clientele and become more comfortable with addressing public concerns about the impacts farms have on their local communities.

The most effective way to evaluate an operation is through a team approach, because no one person can see the whole farm/whole watershed effectively. New England farms are more diverse than those the Field Office Computing System is designed to serve.

Objectives

1. Develop solutions to problems on a more ecological basis.
2. Create local coalitions for ecosystem planning.
3. Gain an understanding of the computer systems Field Office Computing System (FOCS) for developing sustainable agriculture plans.
4. Understand how to use whole watershed ecosystem components when completing individual farm plans. Understand shortfalls of the computer model and what needs to be considered by field staff.
5. Learn to assist landowners/users in making decisions based on social, economic, environmental, and cultural considerations.
6. Have videotapes available for future use by individuals and groups when educational programs are needed.
7. Produce an on-farm checklist that can be used by staff in the field to facilitate whole farm planning.

Professional Development

Coordinator

William Zweigbaum
University of New Hampshire
Cooperative Extension
302B James Hall
56 College Road
Durham, NH 03824

Phone: 603-862-4631

Collaborators

University of New Hampshire
USDA-Natural Resources
Conservation Service

SARE Grant

\$13,500

Match

\$4,600

Duration

Two years

Project Number

ENE95-13



Project Number

ENE95-13

Project Activities

A day long conference was held in February, 1996 featuring Marty Strange from the Center for Rural Affairs and Doug Karlen from the National Soil Tilth Lab. Fifty-seven Extension and NRCS employees from around New Hampshire attended this session. These speakers stimulated new thinking among the participants and did an excellent job of opening up the topics of whole farm planning and systems approaches to farming operations. The group learned a great deal about the direct and indirect consequences of actions taken within the production system and grappled with the complexities of considering the entire ecosystem and watershed when solving problems that are faced as a matter of everyday work.

In the month following this session, the participants worked in county field offices on a case farm that was known to both extension and NRCS staff. These small workgroups looked at devising a farm plan for the operation, looked at the application of the Field Office Computing System, and had the opportunity to discuss issues which arose in the course of evaluating the farm. This gave local agency people a chance to interact and share their strengths and weaknesses with each other and to learn from each other about the environmental, economic and social concerns of a farm operation.

Six weeks after the initial session, the participants were reconvened to discuss and analyze what they had learned by doing the case studies. Twenty-seven people attended this segment of the training program.

A year later, the majority of active participants re-convened to discuss what they had implemented as a result of the previous training sessions. A presentation on the future of New England agriculture and the implications of the changing face of agricultural industries was presented by Marty Strange. This session also included two farm visits to learn more about intensive pasture management, wildlife habitat on farms, watering systems for pasture, use of geotextiles on pasture access roads, impacts of dairy operations on highly erodible lands, manure storage facilities, and other topics of interest to the group.

Conclusion

By sharing the talented people we have, we are broadening our understanding of agriculture and its impacts. We are increasing our comfort level as we provide land use information using a more encompassing approach. We will incorporate local soil, water, air, plant, animal and human concerns as we help people to plan and implement future uses of their land. Problems recognized by these customers will be addressed in a more holistic manner, so that the strengths and weaknesses of potential solutions can also be discerned. These solutions will be expressed in terms of social and economic effects as well as environmental impacts so customers can make informed decisions, use our natural resources wisely, and continue their prosperous and productive contribution to New Hampshire's way of life.

Reported December 1997

Farmer-to-Farmer Learning Groups: Curriculum for Establishment and Facilitation

Summary

This project allowed the Cornell Cooperative Extension of Cayuga County to develop an educational guidebook for establishing and facilitating learning groups. These groups have been very effective in helping farmers, extension agents, and agri-service businesses and organizations exchange information.

Objectives

1. Encourage the establishment of farmer-to-farmer learning groups that enhance sustainable agriculture.
2. Survey existing farmer-to-farmer learning group participants and facilitators to determine effective methods for developing and facilitating farmer-to-farmer learning groups.
3. Develop and adapt educational materials in the form of a guide book for the implementation of farmer-to-farmer learning groups.
4. Publish, market and distribute developed guide book to Cooperative Extension educators, farmers and agri-service organizations in the SARE Northeast Region. The first copy would be complimentary to extension educators.

Background

Farmers practicing sustainable agriculture indicate that they use other farmers as a major source of information when making decisions about their farm businesses. Facilitating such farmer-to-farmer learning and transfer of information can be accomplished through developing learning groups.

Cornell Cooperative Extension of Cayuga County has successfully implemented learning groups over the last six years. These learning groups focus on bringing together farmers to share experiences, exchange information and seek out ideas. This concept has generated interest among other extension educators, farmers and agri-service businesses and organizations.

This project involved the development of an educational guidebook for establishing and facilitating learning groups.

Specific Project Results

Existing farmer-to-farmer learning group participants and facilitators were identified through a review of literature, electronic bulletin boards and lists, agricultural publications and word of mouth. A survey was developed to determine how groups were established, what were the benefits and effectiveness of groups, how the groups were facilitated, and what activities have been most useful. Positive and negative experiences were solicited. Interviews of several people involved in groups were done to gather more in-depth information.

The interest in farmer-to-farmer learning groups is increasing all the time. The survey respondents were overwhelmingly positive about the impact the

Professional Development

Coordinator

Kathy Barrett
Cornell Cooperative Extension
of Cayuga County
248 Grant Avenue
Auburn, NY 13021

Phone: 315-255-1183

Fax: 315-255-1187

Collaborators

Cornell Cooperative Extension
Cayuga County Natural
Resources Conservation
Service

SARE Grant

\$24,095

Match

\$7,614

Duration

September 1996 to November
1997

Project Number

ENE95-15



Project Number
ENE95-15

groups have had on their farms and their lives. Up until now, information on how to establish and facilitate groups has been by word of mouth or extrapolated from the general study of group work and dynamics.

The success of these learning groups justifies extension educators being trained in how to establish and facilitate them. Extension educators have traditionally used workshops, demonstration, lectures and personal contacts in their educational programs. Learning groups require some new methods and skill with which extension educators on the whole are not familiar or comfortable.

A guidebook has been developed drawing on the survey and interview results. The guidebook draws on the practical experience

of farmers, extension agents and agri-service people. Examples of effective groups illustrate the methods described. This guidebook gives practical methods that can be used to start a learning group. Group dynamics, adult learning, facilitation skills and educational activities are provided.

The guidebook provides: 1) Recommendations and methods for establishing groups. 2) Educational methods for facilitating groups. 3) Educational tools for obtaining groups learning goals.

The guidebook will be published, marketed and distributed to Cooperative Extension educators, farmers and agri-service organizations in the SARE Northeast Region.

Reported November 1997

A Diagnostic Team Approach to Enhancing Dairy Farm Sustainability

Summary

The goal of this project was to implement a Minnesota model for using diagnostic teams on dairy farms. The teams would initially focus on two key areas: reducing incidence of mastitis and increasing income over feed costs.

Farm advisors in western Pennsylvania were invited to an initial series of meetings with personnel from the University of Minnesota to learn about diagnostic teams. Thirteen farms have diagnostic teams in place and have shown progress in achieving the farm family's goals in reducing somatic cell counts and improving milk production (and often income over feed costs).

Objectives

1. Implement a model for forming diagnostic teams for critical farm level problem solving.
2. Improve team members' skills in problem solving, critical thinking and whole farm planning.
3. Utilize farm-oriented diagnostic teams on participating dairy farms.
4. Evaluate the impact of the diagnostic teams and revise training materials.
5. Disseminate information about the effectiveness of diagnostic teams through field days, pasture walks and educational conferences.
6. Assist team members in forming new teams and expanding problem focus areas.

Reported December 1997.

Professional Development

Coordinator

Lisa Holden
Dairy and Animal Science
324 Henning Building
University Park, PA 16802

Phone: 814-863-3672

Fax: 814-865-7442

Collaborators

Pennsylvania State University
Pennsylvania farmers

Grant

\$34,650

Match

\$40,866

Duration

1996 to 1998

Project number

ENE96-16



Holistic Resource Management: Eastern New York Pilot Project

Summary

This project organized a series of workshops to introduce the theory and practice of Holistic Resource Management (HRM) to agricultural agency field staff and farmers in eastern New York. HRM is a system for setting goals and making decisions that takes into account profitability, natural resources, the environment, and quality of life.

Key Results

- The project succeeded in introducing HRM to eastern New York state.
- HRM programming promises to benefit farms by offering a more effective management approach.
- Weak Link-a-Thons served as a non-threatening forum to share farm problems and obtain free analysis and advice from a group of peer consultants in the context of the farm host's holistic goal. Such farmer-to-farmer networks promise to set an example to the broader agricultural community — both agency personnel and farmers.
- The course exercises developed a new tool kit which can be adapted for farm enterprises, agency activities, or agricultural organizations.

Background

The Holistic Resource Management: Eastern New York Pilot Project sought to introduce agricultural agency field staff and farmers to the theory and practice of Holistic Resource Management. HRM is a system for setting goals and making decisions that takes into account profitability, natural resources, and the environment, and quality of life. This value-driven management approach provides users with a new perspective and effective tools for making their farm a success on many levels.

HRM assists farmers and agency personnel advising farmers in the setting of a farm goal that will inform all farm decisions. HRM testing guidelines and concepts provide a decision-making framework that can mean the difference between bankruptcy and turning a profit, between burnout and an energized family life, between depleted soil and regenerated land.

Project Activities

The project's primary tool was a series of courses taught by Ed Martsolf, the most experienced HRM instructor in the eastern U.S. These workshops took the students through a process designed to shift their paradigm about

Professional Development

Coordinator

Tracy Frisch
Regional Farm & Food Project
27 Elm Street
Albany, NY 12202

Phone: 518-426-9331
Fax: 518-465-8349

Collaborators

Cornell Cooperative Extension
USDA-NRCS
New York Pasture Association
Green County Soil and Water
Conservation District
Montgomery County Soil and
Water Conservation District

SARE Grant

\$10,510

Match

\$5,070

Duration

October 1, 1996 to September
30, 1997

Project Number

ENE96-20



agriculture — resulting in changes in attitudes and understanding. The courses also developed farm business management skills which were consistent with HRM principles. Students started by identifying their core values and then moved through a history of agriculture in the decades since World War II. They contrasted biological and mechanical systems, learned about the solar chain of energy conversion into dollars, and gained familiarity with the HRM testing guidelines.

In addition to presenting an alternative approach to thinking and managing farming enterprises, the courses showed how farmers, assisted by able facilitation and some structure, can come together to problem solve constructively.

As a follow-up to the workshops, we have established two farmer support networks which generally meet monthly to help put HRM in practice. Spring network meetings focused on establishing a holistic goal for one's farm and applying HRM testing guidelines to decision making. The holistic goal addresses quality of life, environmental stewardship, and profitability (economic sustainability). A farmer uses this goal in tandem with the testing guidelines to evaluate how well an array of possible options under consideration fit the holistic model.

Over the summer the networks held meetings on one another's farms. Informally facilitated by the host farmer, our Weak Link-a-Thons generally last for 3 to 4 hours and provide an opportunity to delve more deeply into the issues affecting that farm. They include a brief farm tour and have elicited lots of constructive input for the farm family or operators. These Weak Link-a-Thons serve as a non-threatening forum to share farm problems and obtain free analysis and advice from a group of peer consultants in the con-

text of the farm host's holistic goal. In these networks, the depth of thinking, willingness to reveal problems, and concern for other farmers' challenges is demonstrably greater than in our non-HRM farmer network initiated around the same time.

What Was Learned

The original plan for this project was modified in several ways. We expanded the target farmer audience from dairy farmers to all interested farmers, due to the high level of interest expressed and the complications of dairy farmer recruitment. Also in response to demand, we consolidated the two half-day follow-up workshops proposed in our grant into a two-day advanced course in financial planning. We trained fewer agency personnel than anticipated, as a result of factors such as overloaded schedules, lack of supervisor approval, the overwhelming number of required or strongly recommended in-service trainings offered, inflexible work plans, and the fact that HRM training was not yet well-recognized in our region. One unexpected result was that course participants from outside our region plan to organize HRM courses in Massachusetts and Quebec.

extension staff were especially interested in using value clarification tools and the three-part goal development in their work with farmers. NRCS and Extension personnel seemed less clear about how they might use other aspects of the holistic management system in their highly structured work. Many of the farmers may be more ready to apply HRM principles and practice to their operations than agency personnel functioning under the existing paradigm.

Feedback from Farmers

Lyle Purinton, dairy farmer, and Cara Alexander, herdsman, wrote: "We have been operating our dairy farm since the late 1970s and have been the way of the 'bigger is better' and 'technology has all the answers' route. In the last few years, we have begun to feel that we're being led down the proverbial 'primrose path' by some of the experts and organizations from whom we garnered advice and ideas. On our farm, we have made some radical changes, moving unknowingly toward a more holistic program without the benefit of any kind of guidance or definite plan.

"The HRM course has given us a better understanding of what we have been trying to do, and has us believing that maybe we are not crazy after all. The ideas of goal setting and the problem solving or testing plan being written down in black and white and being right there in front of us help to make man-

agement and alternative ideas easier to develop and their impact more thoroughly explored before implementation.

"We feel the HRM course has merit for anyone wanting to develop a better relationship between themselves and their operation, family, and community."

Vegetable grower William Denner wrote "...HRM calls into question many things that I would call the slippery slope of farming — looking for solutions to problems from outside, taking on more debt from machinery, labor that goes unpaid, costs not identified as costs — things that help farmers, little by little, to be driven off the farms. HRM asked me to think about why I want to farm, what I want from farming, what I want from life. It also helped me to see the way my decisions about my farm will shape my life and offered a way to test my decisions before I make them."

Reported December 1997.

Project Number

ENE96-20

Regionally Based Professional Development Program for Grazing Systems Management

Summary

This project combined the efforts of research scientists, extension workers and NRCS personnel in Pennsylvania and Maryland to develop an educational curriculum in management intensive grazing. Several "train the trainer" workshops have been held for extension educators and conservation specialists and more are planned.

Objective

To train extension, conservation specialists, and related agribusiness personnel through regional workshops to transfer information about economically sound and environmentally sensitive integrated grazing systems.

Activities and Results

Personnel from two universities — Penn State and University of Maryland — and NRCS personnel in Pennsylvania and Maryland contributed to the development of this educational curriculum in management intensive grazing. Four different units were developed: Pasture Management, Plant/Animal Interface, Grazing Management, and Economics and Environment. Each unit contains about 150 to 200 pages divided into 10 chapters including technical information, teacher's notes and copies of additional resource material. The goal was to develop a format that is usable by educators in a "train the trainer" approach.

The initial draft of the curriculum was completed in late summer. Producers, researchers, extension educators, and NRCS personnel (total of 10) participated in a three-day comprehensive evaluation of the curriculum. Their comments were incorporated into final copies of the curriculum.

Two-day educational programs/workshops were conducted in Danville, PA and Port Deposit, MD. These programs were attended by 33 extension educators, NRCS personnel, and conservation specialists. Additional educational programs will be conducted in the spring of 1998 in western Pennsylvania. The workshop evaluations will be used to improve the four different units with the goal of having a professional development program that can be effectively used to educate producers and agricultural professionals. The potential impacts and initial feedback from farmers will occur during the next year.

Reported December 1997.

Professional Development

Coordinator

Lawrence D. Muller
Department of Dairy and
Animal Science
The Pennsylvania State
University
University Park, PA 16802

Phone: FILL IN

Fax: 814-863-6042

Email:

lmuller@das.cas.psu.edu

Collaborators

The Pennsylvania State
University
University of Maryland
USDA-NRCS in Pennsylvania
and Maryland

SARE Grant

\$92,149

Match

\$12,576

Duration

1997 to 1998

Project number

ENE96-21

Video Training on Improving Water Quality Featuring Farmers and their Practices in the German Branch Watershed

Summary

Participants are developing an educational video featuring interviews with farmers, extension specialists and other scientists who successfully collaborated in the German Branch Watershed USDA-Water Quality Program. The video will focus on how the team operated and the specific practices that farmers have adopted to enhance environmental quality in their watershed. The video is intended as a model for other watershed improvement projects.

Objective

The video should increase understanding among extension agents and other agricultural professionals about team approaches to watershed water quality improvement.

Background

The German Branch Watershed, located in an agricultural region in Queen Anne's County on the Eastern shore of Maryland, is one of the largest sub-watersheds of the Tuckahoe Creek. The Tuckahoe flows into the Choptank River, which subsequently meets the Chesapeake Bay. In November 1990, USDA selected the German Branch for inclusion in the USDA Water Quality Program. The goal of USDA's five-year watershed project was to provide farmers and ranchers with the educational, technical and financial means to respond voluntarily to on-farm and off-site environmental concerns and related water quality requirements. Ninety-two percent of all operators within the watershed have participated since the beginning of the project.

Project Activities

Project participants have met and outlined general and specific goals of the project. Three of the four filming days for the video have been completed. Editing and distribution of the videos will be done in 1998.

During the first day of filming, in the spring of 1997, we interviewed 10 farmers who talked about their participation in the German Branch project. Each farmer specifically discussed a best management practice of importance to their farm.

During the second day of filming, also in the spring of 1997, we took pictures from a small airplane (services donated in support of the video), starting with the Chesapeake Bay, going up the Choptank River, up the Tuckahoe Creek, and to the German Branch. This footage shows how activities in the German Branch watershed relate to the Chesapeake Bay.

The third filming day, in the Fall of 1997, focused on particular farming practices and natural resource activities in the German Branch watershed.

Professional Development

Coordinators

Jim Hanson and Paul Gunther
Maryland Cooperative
Extension Service
1202 Symons Hall
University of Maryland
College Park, MD 20742

Phone: 301-405-1272
Fax: 301-405-2963
Email: jhanson@arec.umd.edu

Collaborators

University of Maryland
Ten Queen Anne County
farmers

SARE Grant

\$24,351

Match

\$21,500

Duration

September 1996 to September
1998

Project Number

ENE96-22



Project Number

ENE-95-11

A fourth day of filming remains. We will interview Paul Gunther, director of the German Branch Project, and film a few remaining best management practices.

Reported November 1997.

Training, Networking, and Demonstrating Whole Farm Forage Grazing Systems

Professional Development

Summary

Using on-farm demonstrations, case studies, seminars and field days, this project is educating agency personnel about management-intensive grazing. Participants will establish a grazers' network to maintain and enhance the activities initiated by the project. This project is working in partnership with another SARE-supported professional development project, "Training, Networking and Demonstrating Whole-Farm Forage Grazing Systems" (ENE96-21).

Objectives

1. Train extension, conservation partnership and related agribusiness personnel in regional workshops to transfer information about economically sound and environmentally sensitive integrated grazing systems.
2. Use 12 actual farms as demonstrations to serve as training tools, research sites, and educational training centers. Demonstrate to 450 farmers operations using management intensive grazing systems.
3. Establish a farmer network in each of the five regions of Maryland and Delaware for mutual support on forage grazing system issues.
4. Develop six regional economic/environmental case studies that are local enough to interest skeptics, but regional in applicability to other states. Prepare a publication to summarize this information and develop promotional information targeted toward farmers stating the results of this study. Create an educational video to convey this information.
5. Bring new and innovative ideas into the Mid-Atlantic Region on forage grazing issues and their impact on economic and environmental sustainability of farms and communities. Conduct several regional seminars and three farm field tours. Develop a "Thunderbook" for grazing systems that is a product of the seminars.

Methods and Activities

Beginning in November of 1996 we began a working merger with the group lead by Larry Muller at Penn State. Our first joint goal was the development of the training course that both groups had envisioned. Shortly after our first meeting we developed four focus teams to work on four topical areas; Pasture Management, Plant and Animal Interface, Grazing Systems, and Economics & Environment.

Fours ring binders of lessons and reference information were developed as a "Thunderbook" for permanent reference to those who attend the two, two day sessions. The material included information that could easily be developed into programs on various topics on grazing.

Coordinator

Elmer M. Dengler
USDA Natural Resources
Conservation Service
11602 Bedford Road NE
Cumberland, MD 21502

Phone: 301-777-1484

Fax: 301-777-7632

Collaborators

University of Maryland
Maryland Extension Service
Allegany Soil Conservation
District

SARE Grant

\$60,000

Match

\$142,080

Duration

1997 to 1998

Project Number

ENE96-24



Project number

ENE96-24

A trial test of the instructional material was presented to a group of approximately a dozen agricultural professionals including several livestock operators in September.

Using the title "Management Intensive Grazing Course," two separate two day sessions were presented in October at Danville, PA and Donaldson Brown Center at Port Deposit, MD covering the topics of 'Pasture Management' and "Plant and Animal Interface." Two weeks later at the same locations the topics of "Grazing Systems" and "Economic & Environment" were given to the same students. Over 30 individuals attended these sessions.

Last Winter we also worked on demonstration projects for individual extension Offices and conservation district offices in Maryland and Delaware. We had about 25 applications and selected a dozen innovative management intensive grazing ideas that would be focal points for local demonstration activities in future years. Due to severe drought conditions, many of these were not installed and we hope they will be put in place next year.

Using feedback from the first two sessions we hope to see what can be developed to provide additional support to people using management intensive grazing.

Reported December 1997.

Management and Evaluation of Soil Health

Summary

Our goal is to provide extension agents and others with current and practical knowledge of soil health, especially the connection between organic matter/biological activity and chemical and physical soil properties.

We are offering inservice training workshops and developing and disseminating educational program packages. An advisory committee of extension agents and specialists from across the region is guiding the specifics of training content and format.

To date, the first of the two scheduled workshops has been held, with 29 extension and NRCS agents from nine states participating in workshops, demonstrations, small-group problem solving and discussion. Evaluation of the program overall was quite positive, and a good deal of feedback and suggestions were received. Currently, the first program package, a half-hour slide show introducing the field of soil health, is being scripted, and plans are underway to revise the training for next year. In addition, an electronic list server, soilquality@list.uvm.edu, has been initiated to further the discussion among past and future participants of the workshops.

Objectives

1. Provide inservice training on soil quality management and assessment to 50 to 60 extension agents from the mid-Atlantic Region.
2. Develop and distribute two packaged education programs for extension staff to use in their own local education programs.

Reported December 1997.

Professional Development

Coordinator

Laurie Drinkwater
Rodale Institute
611 Siegfriedale Rd
Kutztown, PA 19530

Phone: 610-683-1437
Fax: 610-683-8548
ldrink@roadleinst.org

Collaborators

Rodale Institute
Penn State University
Rutgers University
Cornell University
USDA/ARS
University of Maryland

SARE Grant

\$60,000

Project number

LNE96-26

In-Service Training on Sustainable Animal Agriculture

Professional Development

Summary

The focus of this project was an in-service training conference for extension colleagues from around New England who conduct educational programs for dairy and livestock producers. Participants at the October, 1996 training conference learned new information about sustainable grain production, alternatives to antibiotics, nutrient management, composting, recycling, water quality protection, and direct marketing of milk. Participants, surveyed four months after the conference, also report using this information in newsletters, group presentations and individual contacts.

Objectives

1. Provide a training experience on technology transfer for New England extension colleagues who routinely conduct educational programs with dairy and livestock producers.
2. Share knowledge of sustainable animal production practices and projects happening around New England.
3. Share experiences about innovative ways for learning to take place among dairy and livestock producers.
4. Share information on assessing the educational impacts of extension programs aimed at dairy and livestock producers.

Activities and Results

The major focus of this project was an in-service training conference for extension colleagues from around New England who conduct educational programs for dairy and livestock producers. This conference occurred on October 24-25, 1996 at The Lake Morey Inn, Fairlee, VT.

The program included 13 short presentations about sustainable agriculture projects and practices going on in New England, with an emphasis on those practices that relate to animals. Breakout sessions looked at whole farm analysis, assessing impacts of extension programs, increasing access to extension, and new program delivery methods. The climax of the conference was the sharing of experiences from around New England in the following four areas: how to teach holistic farm analysis; innovative ideas for assessing impacts of extension programs; ways for producers to increase access to extension staff; and assessment of new program delivery.

A proceedings summarizing each of the presentations as well as discussions in the concurrent sessions was published and distributed to participants.

There were 68 participants, exceeding the planning committee's goal of 50. All six New England states were represented. The majority of Extension personnel (44) who conduct educational programs for livestock and dairy

Coordinator

Calvin Walker
University of Maine
Cooperative Extension
5735 Hitchner Hall
Orono, ME 04469

Phone: 207-581-2791

Fax: 207-581-4430

Email:

cwalker@umce.umext.maine.edu

Collaborators

The Universities and Extension
Systems of:
Connecticut
Maine
Massachusetts
New Hampshire
Rhode Island and
Vermont

SARE Grant

\$7,000

Match

\$4,000

Duration

October 1996 to October 1997

Project Number

ENE96-27



Project Number

ENE96-27

producers attended the conference. Other participants included representatives of the Natural Resources Conservation Service, the Farm Service Agency, and producers.

Four months after the conference, participants were surveyed. They were asked to evaluate the conference and indicate ways how it was impacting their programs with producers. About twenty percent of the surveys were returned. Responses indicated that participants had already used information they gained at the conference in newsletter articles and presentations. Survey responses also suggest that participants would like an activity like this repeated regularly, every year or two, and would like presentations on cutting-edge information and technology.

Participants also suggested that any future training include more farmers, who serve as a source of excellent ideas for future programs and also as a sounding board.

Project coordinator Calvin Walker believes the potential benefits will be felt for some time. "Some impacts don't occur for months or even years later. For example, in my own programming, I am still seeing the impact of some of the presentations from this conference. I have used information from six of 13 presentations. I have been better able to answer producer requests for information on soybean production, mycotoxins, and antibiotic alternatives. I also helped producers solve problems on biosolids management and water quality."

Reported November 1997.

Developing and Publishing Sustainable Farming Resources

This project will develop a series of lesson plans targeting key integrated crop management (ICM) and integrated pest management (IPM) issues and a grower-oriented field guide to common ICM and IPM field questions.

Objectives

1. Create a multistate advisory group of extension personnel and growers to facilitate the development of 24 educational modules and the revision of a crop management pocket guide.
2. Develop and produce eight educational modules in year 1 of the project and 16 more in year 2 in an effort to empower individuals to adopt sustainable farming practices at the local level.
3. Teach extension professionals to use these new educational modules; record and evaluate clientele use of them.
4. Within six months of funding, develop an improved, regional version of the publication *Your Pocket Guide to Alfalfa and Field Corn Management*, in concert with the educational subjects in the modules.

Abstract

The goal of this grant is to develop educational resources that enhance the effectiveness of cooperative extension and other agency personnel in disseminating sustainable crop management information. These resources will be available for integration into outreach efforts designed to help Northeast producers improve the environmental and economic efficiency of their agricultural resources.

The focus of these materials will be directed by an advisory committee composed of personnel from cooperative extension, the USDA Natural Resources Conservation Service, private agricultural businesses, and growers. We will develop a series of 24 lesson plans targeting key ICM and IPM issues of importance to producers in the northeast. These educational modules would be designed to enhance grower educational efforts by Cooperative Extension and other outreach multipliers.

We will also produce a grower-oriented field guide to common ICM and IPM field questions.

Examples of possible lessons are: Reading a Soil Test Analysis Report, Management of Corn Rootworms in Field Corn, Ridge Tillage, etc. Lesson modules will be presented to in two planned workshops to make sure those delivering the message are familiar with the goals, format and educational suggestions of the module's authors, as well as the subject material.

A continuing evaluation process will be developed to monitor module use and knowledge gained by individuals receiving the instruction.

Approved for funding March 1997.

Professional Development

Coordinator

Philip L. Sutton
Cornell Cooperative Extension
Integrated Pest Management
Program
420 East Main Street
Batavia, NY 14020-2599

Phone: 716-345-0626

Fax: 607-343-1275

Email: psutton@cce.cornell.edu

Collaborators

NYS IPM Program
NRCS

Sare Grant

\$42,314

Match

\$9,742

Duration

Two years

Project Number

ENE97-28



University of Maine Cooperative Extension Compost School

Summary

Through this project, 80 New England USDA and extension personnel will attend a week-long composting course that combines classroom training with hands-on activities and visits to composting operations. Course graduates will acquire knowledge and skills about medium- to large-scale on-farm composting to assist farmers in assessing composting as a component of a whole farm system.

Objectives

1. USDA and extension personnel in New England will effectively address compost related issues by acquiring the knowledge and skills for medium and large-scale enterprises.
2. Eighty trained USDA and extension personnel will assist farmers in assessing the drawbacks and benefits of composting as a component of a whole farm system.

Abstract

Composting can be an important method of returning organic matter to soils, but only three percent of the organic waste in the United States is currently being composted. Composting helps by stabilizing raw organics in an environmentally sound method. It can also be a source of farm revenue by converting what is a disposal problem into an economic asset.

While it is likely that the level of composting in the United States will increase, there are questions that need to be asked before composting is done on the farm. It is possible that composting may not fit into a particular farm situation. USDA and extension personnel need to be able to render accurate information to the agriculture community on composting operations. They should be able to explain when it is appropriate, the economics involved, and the range of uses for compost.

This proposal seeks to provide training for 80 USDA and extension personnel from New England in providing the help and information necessary for the agricultural industry to benefit from on-farm composting. They will attend a week-long course which includes three days of classroom work combined with hands-on activities. In addition, the course will have two days of site visits to various central Maine composting operations. Securing this grant will enhance the existence of the school beyond two years. The present plans for developing the school include a completion certificate to be issued to all participants who successfully complete the program.

Approved for funding March 1997.

Professional Development

Coordinator

Neal Hallee
University of Maine
Cooperative Extension
5741 Libby Hall
Orono, ME 04469-5741

Phone: 207-581-2722

Fax: 207-581-1387

Collaborators

University of Maine

SARE Grant

\$101,560

Match

\$91,141

Duration

Two years

Project Number

ENE97-29



A Video of Innovations in On-Farm Marketing in New England

Summary

With the goal of supporting extension educators' ability to help their clients establish or expand on-farm markets, project participants will produce and broadly distribute a video documenting creative, on-farm marketing strategies on 10 to 12 New England farms. The video will show specific examples of successful on-farm markets, with details explained by the farmers who developed and manage the markets.

Objectives

1. Increase the awareness of extension educators about the range of strategies and methods that have potential for their clients interested in on-farm marketing.
2. Provide a tool for extension educators that will enhance their capacity to explain and explore direct marketing options with their clients.

Abstract

A high-quality video will document creative on-farm marketing strategies and techniques at 10 to 12 farms in New England. In the video, farmers will describe innovations in marketing, management, and customer service that are key to their success. The final one-hour video will be widely distributed to extension personnel as an educational and reference tool.

This resource is needed because extension personnel increasingly recognize the importance of including marketing in their educational programs, but their training and available information resources on marketing are limited. Direct marketing, including on-farm marketing, has an important role to play in maintaining the economic viability of small farms in the Northeast. The proposed video will benefit extension work in this area by providing specific examples of successful on-farm markets, with details explained by the farmers that developed and manage the markets. The ideas and options presented in the video will improve the ability of extension educators to put together marketing programs and to assist their clients with the establishment or expansion of on-farm markets.

Several farmers that run farm markets with the desired characteristics have already agreed to participate in the video. The identification and selection of the final group of markets to be included will be determined with input from a four-state advisory group comprised of two experienced farmer/marketers and two extension specialists with marketing expertise. A diversity of products will be represented in the video; vegetables will dominate, but fruit, ornamentals and maple will be included. Three types of on-farm marketing methods will also be represented: roadside market, pick-your-own, and community supported agriculture.

Approved for funding March 1997.

Professional Development

Coordinator

Vern Grubinger
University of Vermont Extension
System
157 Old Guilford Rd.
Brattleboro, VT 05301

Phone: 802-257-7967

Fax: 802-257-0112

Collaborators

University of Vermont
University of New Hampshire
Cooperative Extension
University of Connecticut
Cooperative Extension
Walker Farm
Wishing Stone Farm

SARE Grant

\$18,233

Duration

One year

Project Number

ENE97-30



Multi-Media Aids & In-Service Training Program for Using Insecticidal Nematodes

Biological pest controls, particularly insecticide nematodes, require a knowledgeable user to achieve acceptable results. This project will develop instructional aids — a video, companion fact sheet, slide set, methods manual, bibliography computer disk, website, and electronic expert panel — on using nematodes to control insect pests. These aids will be used to train extension personnel to assist end-users in using beneficial nematodes in three commodities: cranberries, strawberries and turfgrass.

Objectives

1. Assemble insecticidal nematode training and resource materials including instructional video, companion instructor fact sheet, slide set, website, computer searchable bibliography of literature, and methods manual.
2. Use training and resource materials to educate:
 - a) a multi-state cadre of extension personnel who will transfer this knowledge to end-users within their own states, and
 - b) end-users in the Northeast Region through training sessions and seminars held at commodity meetings.
3. Assess the impact of the training program on extension personnel and end-users.

Abstract

Insecticidal nematodes are remarkably versatile in use against diverse insect pests, yet are underutilized. Nematodes, like other biologicals, require a knowledgeable user if acceptable results are to be achieved: chemical efficacy is far less constrained than are biologicals by suboptimal storage, application method, temperature, irrigation, soil type, etc. Small wonder then that end-users have been slow to accept this biological control. But first, the educators must be educated.

We propose a multi-media effort to develop instructional aids on insecticidal nematodes. We will provide extension personnel with the tools to assist end-users in using nematodes to achieve optimal results in three commodities, each with significant constraints in employing chemical insecticides: cranberries (water quality threatened), strawberries (control agents unavailable), and turfgrass (toxic residues, bird kills). The training aids will be heavily utilized in an intensive workshop intended to create a multi-state cadre of instructors comprised of extension personnel. Participants will transfer their training to end-users within their home states through sessions and seminars held at commodity meetings. This approach specifically addresses the Congressional pesticide reduction goals and will encourage environmentally friendly grower practices and thereby promote agricultural sustainability.

Approved for funding March 1997.

Professional Development

Coordinator

Sridhar Polavarapu
Rutgers University
Dept. of Entomology
New Brunswick, NJ 08903-0231

Phone: 908-932-9459

Fax: 908-932-7229

Collaborators

University of Rhode Island
Ocean Spray
University of Maryland
The Pennsylvania State University
University of Connecticut
University of Delaware
University of Massachusetts
OARDC
University of New Hampshire
Cornell University
Alstede Farms

SARE Grant

\$59,163

Match

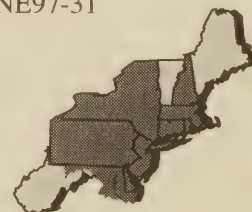
\$275,000

Duration

Three years

Project Number

ENE97-31



The Farmer's Relevant Voice: A Farmer-Produced Educational Program for Watershed Coordinators

Professional Development

Summary

Farmers will serve as coordinators, teachers and learners in the development of a video-based educational program for watershed coordinators. Project goals are to enhance farmers' leadership and authority in the design of environmental stewardship programs and to increase awareness of farmers' interests and economic constraints by other agricultural and land use professionals.

Objectives

1. To enhance farmers' leadership and authority in the coordination and design of agricultural environmental stewardship programs through their active involvement in the production and dissemination of a video-based educational program for watershed coordinators.
2. To increase awareness among agricultural professionals of farmers' economic, environmental, and social perspectives of agricultural environmental management.
3. To stimulate recognition by agricultural professionals of farmers' interaction networks and the potential role of these networks in the development, implementation, and critical analysis of agricultural environmental management programs.

Abstract

Due to increasing concern about the agricultural contributions to nonpoint source pollution, the state of New York is promoting the formation of county-based programs to assess and prioritize agricultural impacts on the environment. Farmers are concerned that watershed-based environmental stewardship programs that primarily focus on technical solutions to static environmental conditions may not appropriately consider their interests, economic constraints, quality of life concerns, or acknowledge their ability to take leadership roles in local environmental stewardship programs.

The proposed program will involve farmers as learners, coordinators, and teachers in the development of a video-based educational program for watershed coordinators. Farmers' associations, to be developed in conjunction with three New York State watershed programs, will engage in a farmer-coordinated learning process that will facilitate the formation of communications networks and intersectoral information-sharing meetings. These interactions will include cross-watershed visits to compare program implementation processes and decision-making factors affecting farmers' implementation of environmental stewardship practices. Based on these interactions, farmers will coordinate the development of a video that will describe their perspectives, practical environmental awareness, and vision for effectively implementing watershed-based environmental stewardship programs. This video will form the basis for a

Coordinators

Barbara Bellows & Mike Walters
Cornell University
Riley Robb Hall
Department of Agriculture & Biological Engineering
Ithaca, NY 14853

Phone: 607-255-4537
Fax: 607-255-4080
Email: bcb5@cornell.edu

Collaborators

Cornell Cooperative Extension
Upper Susquehanna Coalition
The Regional Farm and Food Project

SARE Grant

\$50,016

Match

\$30,432

Duration

Two years

Project Number

ENE97-32



Project Number

ENE97-32

farmer-facilitated regional training program for agricultural agents, environmentalists, policy makers, agribusiness personnel and others involved in watershed program development. Workshops associated with the regional meetings will encourage participants to examine how they might modify current agricultural environmental management programs. This "role-reversal" training process

will provide farmers with credibility as leaders of environmental stewardship programs and as knowledgeable implementers of environmental stewardship practices while enhancing the ability of watershed professionals to develop programs that are farmer-participatory and technically appropriate.

Approved for funding March 1997.

Riparian Buffer Training

Summary

This project will provide training opportunities for New England and Mid-Atlantic resource managers in riparian buffer functions, values, establishment, enhancement, and maintenance. It will include information on site evaluation, cost-share programs and buffer design, incorporating landowner objectives and emphasizing buffer management as part of larger watershed and farm management systems.

Abstract

Vegetated riparian buffers have been identified as an effective filter for non-point source pollution. On agricultural lands, vegetated buffers reduce nutrient and sediment loads in streams by slowing overland flow and reducing streambank erosion. In addition to their water quality benefits, riparian buffers provide critical habitat for many aquatic and terrestrial animals. Vegetated buffers can provide benefits to landowners and rural communities through enhanced recreational and aesthetic appeal and enhanced farm income.

In recognition of these benefits, many riparian buffer initiatives have been implemented throughout the Northeast Region and in the United States. Riparian buffers have been identified as key resources and focus for educational programs in New York, New Jersey, Ohio, Minnesota, the Chesapeake Bay Watershed, and other locations.

The purpose of this project is to offer an in-service training opportunity on riparian buffers, that will include enhancement, installation, and management of these systems. This training targets Northeast and Mid-Atlantic agricultural extension agents, forestry and wildlife specialists, soil conservationists, and other resource professionals who work with farmers, other rural landowners, and communities to manage farmlands, open space, forests, streams, wildlife and fisheries.

The training will include information on riparian functions, values, site evaluation, cost-share programs and buffer design, incorporating landowner objectives and emphasizing buffer management as part of larger watershed and farm management systems. It will be patterned after a pilot training program already under way at the University of Maryland Cooperative Extension Service and funded by the Chesapeake Bay Program and U.S. Forest Service.

Objective

To train resource managers in the Northeast and Mid-Atlantic region in riparian buffer functions, values, establishment, enhancement, maintenance, site evaluation and buffer design.

Approved for funding March 1997.

Professional Development

Coordinator

Robert Tjaden
University of Maryland
Cooperative Extension Service
Wye Research & Education
Center
PO Box 169
Queenstown, MD 21658

Phone: 410-827-8056
Fax: 410-827-9039
Email: RT20@umail.umd.edu

Collaborators

U.S. Forest Service
Maryland Forest Service
Chesapeake Bay Program
NEFREC
NENREM

SARE Grant

\$20,500

Match

\$5,000

Duration

One year

Project Number

ENE97-33
Summary



Building a Future for Farming in the Northeast

Summary

Through conferences that will bring together a wide range of resource people, this project will provide a unique educational opportunity for Extension staff and other USDA field personnel to learn about Community Supported Agriculture (CSA). Conference sessions will cover CSA concepts, benefits, working principles, skills and resources. Goals are to inform extension and other USDA personnel about the growing CSA phenomenon, its success in helping to sustain farming, and its future potential as a production and marketing system for a larger group of farmers.

Objectives

1. Educate extension staff and other USDA field personnel about CSA concepts, benefits, working principles, skills and resources.
2. Promote establishment of new CSA farms and support the further development of existing CSA farms.
3. Increase public awareness of the benefits and importance of involvement and investment in regional agriculture and CSA in particular.

Abstract

Becoming knowledgeable about CSA and developing partnerships with the growing number of Northeast CSA projects is an important way for extension and other USDA field personnel to stay relevant, maintain excellence and continue to be useful to a wide range of farmers. Community Supported Agriculture (CSA) has proven to be an effective way for farmers throughout the Northeast to maintain profitable, environmentally sound farming systems, while assuring a high quality of life and a high degree of urban and rural community support. CSA farms are growing rapidly in number and are increasingly viable marketing and distribution channels for the products of both CSA and non-CSA farms in the Northeast.

Community Supported Agriculture of North America (CSANA), in collaboration with the Massachusetts Extension System and other organizations will sponsor a Northeast CSA Conference to bring together a wide range of resource people, including farmers, CSA members, representatives from various farmer, consumer and food security organizations, and extension and other USDA personnel. The conference will incorporate numerous workshops, farmer-to-farmer and farmer-to-extension staff training sessions, presentations and analyses to: educate participants about CSA concepts, benefits, working principles, skills and resources; promote new CSA farms and support the further development of existing CSA; and increase community involvement in regional agriculture through CSA.

Approved for funding March 1997.

Professional Development

Coordinator

Elizabeth Keen
CSANA
Indian Line Farm
Box 57 Jugend Rd
Great Barrington, MA 01230

Phone: 413-528-4374
Fax: 413-528-4374
Email: csana@bcn.net

Collaborators

UMass Extension
Just Food Alliance
Wilson College

SARE Grant

\$25,190

Match

\$35,460

Duration

Three and a half months

Project Number

ENE97-34



A Comprehensive Training in Sustainable Agriculture

Summary

The project will work intensively with a group of 10-20 extension and NRCS personnel from Vermont and New York to broaden their appreciation and enhance their understanding of the philosophy, scientific principles, and practical application of sustainable agriculture.

Methods & Approaches

The training will be designed to enhance the ability of extension and NRCS to obtain and interpret a wide range of information that serves current client interests and will help lay the groundwork for a future farming and food system that is profitable, environmentally sound, and socially just.

The training program will consist of classroom presentations, visits to information resource centers, and detailed on-site evaluation of several farms over the course of two years. To provide a local support system for participants and to assure strong producer perspective, agency personnel will be "paired" with progressive farmers from their geographic area who will also take part in the training.

Agro-ecological scientists, food system analysts, and farm and community leaders in the sustainable agriculture community will be the presenters during the classroom session, providing advanced explanations of the intellectual and ecological aspects of sustainable agriculture and food systems. Subsequently, participants will be exposed to a broad range of information sources and methods for obtaining sustainable agriculture education resources during visits to research, demonstration and library sites.

Intensive visits to the farms of producer participants will be used to analyze and demonstrate both innovations and obstacles related to sustainable agriculture practices. These visits will be followed by discussion and analysis of the farm operation, the farmer's information needs, and how agency personnel or programs can or could provide such information.

The content of the training will be aimed at agency personnel who already have a fundamental understanding and acceptance of sustainable agriculture, but have not developed the depth of information or perspective necessary to effect meaningful change in their programming efforts. Agency personnel will be recruited in consultation with extension and NRCS administrators in each state. An attempt will be made to recruit "teams" from each region that have a reasonable balance among the agencies and subject matter expertise.

Approved for funding March 1997.

Professional Development

Coordinator

Vern Grubinger
Center for Sustainable Agriculture
University of Vermont
590 Main St.
University of Vermont
Burlington, VT 05405

Phone: 802-257-7967
Fax: 802-257-0112
Email: verngr@sover.net

Collaborators

UVM Center for Sustainable
Agriculture
Cornell University Farming
Alternatives Program

SARE Grant

\$122,000

Duration

Two years

Project Number

ENE97-35



Review & Evaluation of Educational & Reference Materials Pertaining to Nutrient Management & Soil Health

Summary

In an effort to develop a nutrient management and soil health training curriculum for agricultural professionals, this project will gather and evaluate existing educational and reference materials. Subjects such as soil tilth, organic matter content, percolation, erosion, microbial balance, cation exchange capacity, nutrient holding capacity, and soil structure will be included.

Objectives

1. Collect free materials and purchase materials related to nutrient management and soil health for review.
2. Evaluate materials based on their quality and accuracy of information.
3. Select materials to be used for future nutrient management/soil health workshops.
4. Identify information gaps in existing materials related to nutrient management and soil health and make recommendations for creation of these publications.
5. Assemble a complete binder of information to be used as a tool for future tours and workshops. The binder will be a three-ring type to be added to in future programs. Additional forms of materials (i.e. videos and slide sets) may also be included in the comprehensive collection. Videos and larger publications will be indexed, described and made available for loan.

Abstract

This project will gather and evaluate existing educational and reference materials related to nutrient management and soil health. Materials from various agricultural commodity areas will be reviewed and evaluated by members of the Nutrient Management/Soil Health Committee. The review and evaluation of these materials will provide background and basis for the development of a Northeast Region training curriculum on nutrient management and soil health. This training will be implemented from 1998 through 2003 in the Northeast Region through a series of on-site farm tours and workshops.

Approved for funding March 1997.

Professional Development

Coordinator

Michelle Infante
Rutgers Cooperative Extension
1200 N. Delsea Dr.
Clayton, NJ 08312

Phone: 609-863-0110

Fax: 609-881-4191

Collaborators

Rutgers Cooperative Extension

SARE Grant

\$7,000

Duration

One year

Project Number

ENE97-37



Farm to School Food Education Project

Urban Farm Connections

Key Results

The Hartford Food System coordinated a team-led program from September 1996 through December 1997 to expand the increased use of Connecticut-grown and low-input produced fruits and vegetables served in the lunch program in four City of Hartford Public Schools. The project was carried out in cooperation with the Hartford Board of Education Food Service Program to maximize the use of local produce and to increase the staff's capacity to prepare the produce for school lunches. The project worked with area farmers, produce brokers and a produce fresh-cut processor to address supply and distribution issues.

Key accomplishments include:

- Participating teachers and chefs helped develop the *Farm to School Food Education Curriculum Guide*.
- Discovering that the types and amounts of raw produce that are used must be adapted to the schools' labor and equipment constraints.
- Demonstrating that local schools are viable markets for local farmers, however there is a clear need for an intermediate marketing structure to facilitate institutional purchasing of locally-grown produce.

Objectives

1. Implement an expansion program to increase the amount of Connecticut-grown and low-input produced fruits and vegetables used in the school lunch program in four City of Hartford public schools, which will purchase one-third of their fresh produce from Connecticut farmers (half of whom will be low-input growers), and with the target goal that by 1999 all of Hartford's 32 schools will purchase at least 20 percent of their produce from Connecticut farmers.
2. Create demand for Connecticut-grown produce, especially low-input produce, by instituting a farm and food system curriculum in the Hartford Public Schools.
3. Create the capacity in the school food service cafeterias and their staff to prepare Connecticut-grown fruits and vegetables for school meals.
4. Replicate the project in public schools and institutions in the region.

Methods and Findings

The school lunch program is potentially a substantial and stable market for Connecticut farmers. Linking farmers with local schools is beneficial for both parties and supports USDA health and agricultural policy objectives to double the

Coordinator

Elizabeth Wheeler
Hartford Food System
509 Wethersfield Ave.
Hartford, CT 06114

Phone: 860-296-9325

Fax: 860-296-8326

Email: HN2838@handsnet.org

Collaborators

Children's Culinary Program
Connecticut Dept. of
Agriculture
Fowler and Hunting Produce Co.
Hartford Board of Education
Manchester Community
Technical College
Northeast Organic Farmers
Association of Connecticut
University of Connecticut
Cooperative Extension

SARE Grant

\$33,319

Match

\$43,650

Duration

1996 to 1997

Project Number

LNE96-65



Project number

LNE96-65

amount of produce purchased by the National School Lunch Program (NSLP) and the USDA commitment to increase the amount of organically or sustainably grown produce used in school meals by 25 percent.

Farm Fresh Start, a 1995 pilot project in Hartford, CT, showed that children given hands-on food education increase their knowledge and acceptance of local fruits and vegetables served in the school cafeteria. The Hartford Food System (HFS) expanded the program in 1996-97. Minor production changes allowed school cafeteria staff to use local produce in the menu. On average, produce cost 12 percent to 33 percent more than conventionally grown imported items. Fruits cost an average of 7 percent less than imported equivalents.

The fifteen varieties of local produce used in the two fall periods included: IPM and conventionally-grown apples and pears, peaches, broccoli, corn, red and green cabbage, cauliflower, cucumbers, romaine and leaf lettuce, potatoes, tomatoes, onions and peppers.

During the fall of 1996, the cafeteria staff's efforts to prepare items such as winter squash and field lettuce proved to be unworkable in a high-volume environment. The schools substituted a hydroponic butter-bibb lettuce grown in a Hartford greenhouse for iceberg lettuce for several weeks. While the quality of the product was excellent, the food service found it unsuitable because it cost more per pound than iceberg, was less durable in storage and handling, and the students preferred the crispy iceberg over the softer lettuce. The preparation of whole raw Acorn squash required far more preparation time than the staff could afford, and the final product was not accepted by the students.

For the fall of 1997, a wholesaler with a "fresh cut" operation was engaged to provide pre-cut salad, diced skin-on potatoes and diced butternut squash to the four participating schools. In that period, cafeteria managers reported that an average of 2 extra hours per week was spent in food preparation. At \$8 an hour, the labor cost amounts to \$64/week, or \$704 dollars for the 11-week period.

The school's capacity to utilize fresh local produce hinges on several issues: primarily, the schools need to be guaranteed of a reliable, consistent supply of produce for a reasonable price. Second, the types and amounts of raw produce that are used must be adapted to the schools' labor and equipment constraints. Finally, the students must want to eat the fresh items — that requires making the food attractive on the cafeteria line and making it familiar and desirable to the students through education.

In the 1996-1997 study period, local farmers provided the wholesalers with competitively priced produce that met specifications without making production changes or special accommodations. Cost comparisons showed local apples on average cost 8 percent less, pears cost 7 percent less, Romaine lettuce was 34 percent less, and local tomatoes cost 39 percent more. With planning and simple production changes, the food service can incorporate more seasonal items on the menu. The food service has stated that in order for the "locally grown" program to be viable, all the vendors that bid on the produce would have to handle local growers; presently, many of the wholesalers deal only with the largest producers.

While most children know that vegetables are good for them and that junk foods are

not, food pyramid lessons and nutrition charts do not motivate them to change their eating habits. Children will eat fruits and vegetables when they can learn about them in hands-on, interdisciplinary food education that is linked to changes in the school cafeteria.

The Hartford Food System worked with teachers to develop and implement a food education curriculum that focused on farms, local seasonal produce, and nutrition. The curriculum incorporated interdisciplinary topics including mathematics, science, art, and social studies. One hundred and forty six classes were held and 16 field trips taken to area farms and farmers' markets. Guest lecturers included two farmers, four chefs, and two nutritionists.

The food education classes, half of which were conducted by four volunteer chefs, featured tasting and cooking activities. These direct hands-on tasting and cooking activities encouraged the students to discover the taste of very fresh produce, while in the cafeterias the staff actively encouraged students to try the fresh offerings.

This project has demonstrated that local schools are viable markets for local farmers. While it is impossible to determine the number of farmers who would be affected by the development of this market, it is reasonable to assume that over \$3 million in additional sales per year could be divided among a substantial number of farmers.

For example, in the 1996 and 1997 fall periods, the average per student expenditure on local produce was \$3.11. If the state's estimated 447,000 students consumed \$3.11 worth of Connecticut grown produce in their lunches for the same period, the sales value would amount to approximately \$1.4 million.

Demand for local produce during the 40-week school year would amount to an estimated \$3.3 million, or nine percent of Connecticut's total 1994 level fruit and vegetable farm sales of \$38.15 million.

However, public school cafeterias are mini factories that essentially prescribe one form (one size fits all) of operation, require conformity and discourage innovation. What this project has shown is that when a number of positive factors exist and are interjected into that environment, change can occur and new ways of doing business can surface and even become part of the daily routine. With the commitment and cooperation of the head of Hartford's school food service as well as from key food service management, the schools could obtain reasonably priced, high-quality locally grown produce through conventional channels. By working closely with the food service administration and staff, the Hartford Food System provided simple technical assistance to help cafeteria workers learn to handle highly perishable local produce.

The public school system and the National School Lunch Program is just one potential market for local growers. Other institutions that operate food assistance programs, such as the summer meals program and the school breakfast program, also could purchase locally grown produce.

The opportunities the school system represents suggests that farmers should actively enlist farm organizations such as the Farm Bureau and the Department of Agriculture to help remove marketing barriers and to orient institutional purchasing policy towards local producers.

This project clearly identified the need for an intermediate marketing structure to facili-

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Project number

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tate institutional purchasing of locally grown produce, especially the Hartford schools. Direct delivery by farmers to individual schools has a limited application. Intermediate marketing structures could include a marketing cooperative, an independent broker for a group of growers, or even contract growing that would create advance commitment by the schools to one or more growers.

In the 1995 pilot program, the farmers expressed the need for an organized outlet for local produce, such as a coop, and stated that the biggest problem they faced was a volatile market that undercut prices. Presently, farmers rely on wholesale brokers, which does not afford them the benefits and organizing power of a farmer-operated coop.

Policy Recommendations

To re-establish the link between local growers and local markets, there must be coordinated, consistent and long-term commitment on the part of state and federal agencies, including USDA's Agricultural Marketing Service (AMS), Cooperative State Research Education and Extension Service (CRSEES), and the Food and Consumer Service (FCS) that oversees the School Lunch Program.

Removal of policy barriers would be evident by such actions as the USDA explicitly linking and supporting efforts to use locally-grown produce in the National School Lunch Program and, further, setting specific, measurable targets for how much of that produce will be grown with sustainable practices.

At the state level, removal or reduction of purchasing guidelines that restrict the purchase of Connecticut-grown by state institutions would be evidence of progress.

At the local level, boards of education could take three actions:

1. Integrate all their food-related curricula into one comprehensive approach to food, environmental science, nutrition, health, cooking and agricultural education.
2. Re-examine their food purchasing practices and procedures to determine how these practices may be integrated with other social, economic and environmental goals.
3. Use the cafeteria as an extension of the classroom, where students learn lessons about food, nutrition and social interaction.

Reported November 1997.

New Connections in the Northeast Food System

Urban-Farm Connections

Key Results

In March, 1997, 175 people from 13 states gathered in Hartford, Connecticut for a 3 day conference entitled "New Connections in the Northeast Food System."

The conference highlighted ways that regional food production can benefit lower income urban residents, build communities, create economic opportunity, develop markets for farmers, and preserve farming.

Proceedings from the conference have been published, including extensive summaries of presentations by over 20 speakers.

Objectives

1. Bring together people from throughout the Northeast who want to find new ways to make connections between food producers and communities where obtaining a healthy, affordable diet is a problem
2. Share ideas about how those connections can be made.

Summary of Conference Speakers

Molly Anderson's opening talk provided an overview of the Northeast food system that focused on significant trends in food production, food processing and distribution, and food consumption. She examined these trends in terms of their relationship to such problems as globalization of capital and the food supply, environmental degradation, and food access for low-income people.

Panel I: Identifying Food System Themes, Issues, Gaps, Problems and Strategies

Farmland in the Northeast: John Keene focused on trends in farmland loss and various initiatives to preserve farmland.

Hispanic Food and Nutrition Issues: Grace Damio examined the cultural and historic context of the Hispanic community, and related it to issues of food, nutrition, and poverty.

Dan Ross shared information about his work with the Hispanic community and his organization, Nuestra Raices in Holyoke, Massachusetts. He identified the agricultural context for Holyoke's Puerto Rican community and how it provided economic opportunity.

Welfare Reform and Food Assistance: Kimberly Schevtchuck identified the philosophical underpinnings for much of the conservative political and public opinion which has shaped welfare reform and how changes in the food assistance programs will affect low-income households.

Coordinator

Mark Winne
Hartford Food System
509 Wethersfield Ave.
Hartford, CT 06114

Phone: 860-296-9325
Fax: 860-296-8326
Email: hfoods@erols.com

Collaborators

Hartford Food System
Aetna Business Resources
Food For All

SARE Grant

\$13,000

Match

\$30,236

Duration

One year

Project number

LNE96-68



Project number
LNE96-68

Food Security, Nutrition and Local Foods: Jennifer Wilkins examined the relationship between nutrition education, consumer demand, and the regional food supply. She specifically identified some of the critical barriers to conducting effective nutrition education.

Panel II: Food Project Case Studies

Direct Marketing: Bob Lewis described the relationship of the Farmers' Market Nutrition Program to helping both farmers and low-income families and elaborated on some additional efforts to support "new entry" farmers in New York.

Urban Agriculture: Rosalind Johnson discussed the work of her organization, Sea Change, in addressing food, sustainability, and employment issues in north Philadelphia. The Sea Change urban agriculture program includes a youth project, community gardening, and a CSA.

Marketing to Schools and Developing Food Education Programs: Elizabeth Wheeler described her work in developing a pilot program in Hartford public schools to increase the amount of locally grown food purchased by the system and efforts to increase student demand for locally produced food.

Jeff Sidewater, assistant director of the Hartford public schools food service operation, described the key issues that need to be addressed in order to buy locally produced food.

Food Banks, Farming, and Marketing: Mike Gable reviewed his work with the Pittsburgh Food Bank's Green Harvest Program.

Youth, Farming, and Marketing: Jessica Laborio, Jahira Ottino, and Glynn Lloyd, participants in the Food Project of Lincoln, Massachusetts, described their activities which include a CSA, a farmers' market, food and farm education activities, and work with Dudley Street Initiative in Roxbury.

Panel III: Assessing Community food Needs

Evaluation and Planning: Determining Your Community's Food Needs: Debra Palmer-Keenan provided information on why and how to conduct needs assessments.

Needs Assessments: Andy Fisher of the national Community Food Security Coalition used the "Seeds of Change" report conducted in Los Angeles following the 1992 civil disturbances as a case study for doing a community food needs assessment. His discussion included such approaches as mapping of food programs and services, hunger studies, and resident surveys.

Evaluations: Hugh Joseph provided further information on the use and misuse of different types of program evaluations.

Income Generating Opportunities: Mike Rozyne used market research concepts to approach needs assessment. He explained how to think about community needs from a market research and business-oriented point of view.

Panel IV: Community and Coalition Building

Macro and Micro Overviews: David Hahn-Baker identified some significant global and macro trends, especially with regard to environmental impacts, that will influence food system efforts.

Marty Johnson provided an analysis of community and community building strategies.

Building a City Coalition: Kathy Lawrence described the development of Just Food, an organization working on sustainable food issues in New York City. The talk covered their successes, mistakes, and current efforts in trying to make quality, locally grown food available to everyone.

Building a Regional Coalition: Kathy Roth discussed her work in Berkshire County, Massachusetts, to develop a sustainable food system by organizing the interests of a number of food system stakeholders. She reviewed techniques such as 'moveable food feasts' that support public education and local action.

Building a State Food Organization: Jim Hanna assessed efforts to develop the Maine Coalition for Food Security. He identified projects that address the needs of low-income households as well as ones that connect to food production in Maine.

Developing a State Food Policy: Jefferson Davis, a state representative in Connecticut, reviewed efforts to address food security through state government. He discussed the role that strategic partnerships can play in advancing the agenda of those who are working for a just and sustainable food system.

Reported December 1997.

Project number
LNE96-68

Developing Sustainable Management Tactics for Cucumber Beetles in Cucurbits

Vegetable Systems

Summary

The objective of this project is to develop environmentally benign and cost-effective management tactics for cucumber beetles, thereby reducing the use of insecticides.

Cucumber beetles are very serious pests that can rapidly destroy plantings of cucurbits (cucumber, melon, squash, pumpkin, etc). Growers often use frequent treatment with insecticides to control these pests. Organic growers rank cucumber beetles to be the most important insect pest of cucurbits in the U.S.

Key Findings

Attractant-baited traps containing a very small amount of insecticide show promise for mass-trapping adult beetles under field conditions. This will result in significant reductions in the amount of insecticide used for managing cucumber beetles.

A highly preferred trap crop in combination with attractant-baited traps resulted in reduced injury to protected plants when compared with control plots.

Tests by organic farmers showed that rotenone was better than cryolite or neem. Results indicate that feeding stimulants enhanced the effectiveness of rotenone, permitting the use of reduced rates.

Research is now underway to evaluate the effect of simulated fall cultivation on the overwintering success of striped cucumber beetles.

Objectives

1. Develop trapping techniques to control early season infestations of cucumber beetles.
2. Develop cultural and biological control methods for control of cucumber beetles.
3. Improve the effectiveness of botanical insecticides.

Methods and Findings

Objective 1: Develop trapping techniques to control early-season infestations of cucumber beetles.

A mixture of cucurbit blossom volatiles (TIC) is an effective attractant for cucumber beetles and rootworms when used in traps (Levine & Metcalf 1988 and others). We have improved the effectiveness of such traps through a series of studies (Hoffmann et al. 1996a). During the first year of this project we investigated several types of traps including a design that only requires beetles to land on the trap. Upon landing on the trap the beetles pick up a small dose of toxicant or spores of an insect pathogen. This design would result in rapid control from the toxicant adhering to the beetle or slower control via infection by the pathogen. In this scenario it should

Coordinator

Michael P. Hoffmann
Dept. of Entomology
Cornell University
Ithaca, NY 14853

Phone: 607-255-1327
Fax: 607-255-1720

Collaborators

Cornell University
New York farmers

ACE Grant

\$135,832

Match

\$62,296

Duration

January 1, 1996 to
December 31, 1998

Project Number

ANE95-22



be possible to mass trap beetles using an extremely small amount of toxicant (which never contacts the crop) and remove the toxicant (trap) from the field for disposal elsewhere. The most effective toxicant was a solution of carbaryl (0.3 percent ai) in mineral oil. For organic growers the synthetic toxicant could be replaced with one appropriate for their needs.

Initial studies under field cages on the potential of these traps gave promising results in 1996. Therefore, during the summer of 1997 we investigated the potential for mass trapping cucumber beetles and conducted studies to determine the optimal trap density per unit area. The traps consisted of 16 oz. plastic cups baited with TIC and glued upside down on an eight inch diameter plastic plate. The cup was covered with yellow felt which was saturated with a mixture of mineral oil and carbaryl (0.3 percent ai). One, two, four, and eight traps were installed per plot (1/20 acre) (corresponding to 20, 80, 160, 320 traps/acre) while the plants were at cotyledon stage. The attractant and toxicant were replaced or added on a weekly basis.

These studies showed that plots with one or eight traps had more beetles per plant than plots with one or four traps. At two or four traps per plot the traps were removing over half of the beetles. One trap per plot did not remove a sufficient number of beetles (23 percent) whereas eight traps per plot may have attracted additional beetles from surrounding areas.

Plant injury coincided with the number of beetles per plot. For example, the mean cumulative injury per plant was less than 20 percent in plots with two traps, while the plots with eight traps had 40 percent mean cumulative injury per plant. The mean number of beetles trapped/day/plot increased (approximately doubled) with increasing trap

densities. In addition to striped cucumber beetles, hundreds of western and northern corn rootworms were also attracted to these traps. An unknown number of beetles landed on traps and left before the toxicant had its affect. Thus a potentially large number of beetles may have been killed, but not recorded as captured by the trap.

Since only a small amount of toxicant is required, this method could considerably reduce the amount of insecticides used for managing cucumber beetles. This trapping tactic may also have application in other systems, such as control of corn rootworm adults in small plantings of field or sweet corn.

Objective 2: Develop cultural and biological control methods for control of cucumber beetles.

Cucumber beetle management can also be improved through the development of cultural and biological control tactics. Certain types of cucurbits are highly preferred by cucumber beetles and these preferred types could aggregate beetles and their progeny for more efficient control. Trap crops could be further enhanced by "lacing" them with the long range TIC attractant.

Our preliminary late season trials in 1996 showed that a trap crop alone did not provide adequate beetle control, but that a trap crop plus TIC traps significantly reduced beetle infestations on the protected crop. Therefore, the trap crop tactic was tested again during the 1997 season with on-farm trials. A highly preferred squash type (Seneca Zucchini) was used as trap crop while the main crop was "Munchkin" pumpkin. The treatments include trap crop alone, trap crop + TIC traps, and control. Fifteen percent of each plot was planted to trap crop.

The addition of TIC to the trap crop provided a long range attractant, while the traps provided a means to control beetles attracted to the trap crop. The 1996 late season experiments showed that the average number of live beetles on Munchkin was reduced substantially when the trap crop and TIC-baited traps were present. No such reduction in the average number of live beetles was observed when the experiment was repeated in 1997. However, injury to Munchkins two weeks after planting was significantly less where the trap crop + TIC was present. Also, there were 3-4 times more beetles (including beetles dead on the trap) on the trap crop segment of the plots with TIC traps than beetles on the trap crop segment on plots with trap crops alone.

The results of our 1996 and 1997 experiments show that trap cropping with highly preferred cucurbits in combination with TIC traps is effective in reducing striped cucumber beetle numbers and injury.

In addition to trap cropping, cultural practices such as fall cultivation may affect survival of overwintering cucumber beetles. Our objective was to monitor the fall population of beetles and also to study the effect of fall cultivation and fall clean-up on the beetle mortality.

During late September, when the plants were still green, the beetles were found throughout the field. As the fall season progressed, leaves started drying leaving only a few green patches for the beetles to aggregate. After the first frost there was limited green vegetation and the beetles moved to decayed/damaged and some undamaged fruit in the field. Both visual sampling and sticky card counts showed almost no beetle activity during the first week of Nov. This indicates that the beetles apparently leave

the field as the fall progresses and therefore fall cultivation should be done while the beetles are still active during early fall.

Low levels of beetles late in the season prevented us from testing a range of cultivation equipment. We modified the studies to address both overwintering behavior and the impact of simulated fall cultivation. A complementary experiment was set up under greenhouse conditions to simulate late-summer or fall cultivation. Beetle survival will be quantified in these trials in the upcoming weeks.

Suppression of immature cucumber beetles with entomopathogenic nematodes appears possible and could be especially effective if applied to trap crop plants to control progeny of aggregated adults. Unfortunately, the commercial nematode industry has dwindled drastically since this project started and we have not been able to obtain commercial formulations of the nematode species that we intended to test.

Objective 3: Improving the effectiveness of botanical insecticides.

Preliminary experiments in 1994 with rotenone dust plus the feeding stimulant buffalo gourd root powder (BGRP) gave encouraging results. In 1997, we conducted additional studies to determine the efficacy of rotenone and cryolite alone or in combination with BGRP to improve control and permit reduced use of these insecticides.

The result of these experiments showed that all the botanicals tested caused a reduction in beetle damage. Rotenone at full (with and without the feeding stimulant), and one-half rate (with the feeding stimulant) had the lowest damage and highest beetle mortality. The addition of the feeding stimulant permitted a halving of the rate of rotenone without

Project number:
ANE95-22

Project Number

ANE95-22

a significant reduction in the effectiveness. However, feeding stimulants did not improve the effectiveness of cryolite. Neem did not have any significant effect on the beetle survival or mortality but being an antifeedant it significantly reduced damage caused by beetles to plants.

Conclusions

The trap cropping and use of TIC traps have been found effective against adults of striped cucumber beetles. The use of trap cropping will entail some obvious costs to producers, but should be minimal because all that is involved in rearranging specific crops (preferred and nonpreferred) which most

plant anyway. Mass trapping will involve some specific expenses, however, those costs should be similar to the current costs associated with the use of insecticides. We hope to develop detailed cost analyses of the alternative control tactics for cucumber beetles.

Based on our research we would encourage more farmers to evaluate trap crops for control of striped cucumber beetle. We would also encourage the destruction of crop residue in the fall to reduce overwintering beetle populations. Another tactic would be to scout fields in the fall once most green foliage is gone and spot treat heavily infested fruit.

Reported December 1997.

Integrating Microbial Insecticides and Oils into Sweet Corn IPM in Massachusetts

Vegetable Systems

Summary

Fresh market sweet corn is a major vegetable crop in the Northeast. Caterpillar pests of corn, which feed directly on sweet corn ears inside the husk, cause from 10 to 100 percent unmarketable ears if left uncontrolled. Currently, farmers have few alternatives to restricted-use, broad-spectrum insecticides that deplete beneficial insects and have high mammalian toxicity. This project evaluated foliar and direct silk applications of microbial insecticides and vegetable oils as alternative methods which pose less risk to applicators and the environment and which conserve natural enemies.

Key Findings

Bacillus thuringiensis (Bt) products can be integrated into a standard IPM system for European corn borer (ECB) control as a direct replacement for conventional insecticides with no extra cost to growers and with positive benefits to the agro-ecosystem.

In late-season corn, commercially acceptable levels of control (90-100 percent undamaged ears) were achieved in experiments where foliar applications of Bt were used in combination with a direct-silk oil treatment.

Use of biointensive methods in corn will result in higher populations of beneficial insects in corn and other crops on diversified vegetable farms with increased suppression of other insect pests such as aphids.

Fourteen of the 17 participating growers were satisfied with the control they achieved with Bt and plan to use it in the future. Reasons for choosing Bt over conventional products were applicator safety, easier relations with neighbors, shorter re-entry and preharvest intervals, and conservation of their beneficial insects.

Objectives

1. Evaluate the effectiveness of commercial Bt products against European corn borer and fall armyworm in fresh market sweet corn in Massachusetts.
2. Develop an alternative control for corn earworm using an oil and Bt barrier applied directly to the silk.
3. Integrate alternative insect controls into current Integrated Pest Management (IPM) systems used by sweet corn growers in the Northeast.

Method and Findings

In early season corn, ECB is the primary insect pest. Commercial Bt products were tested in 1994-1996, in 34 trials conducted on 17 farms in Massachusetts. Standard sweet corn IPM scouting methods, thresholds and spray intervals (5-7 days)

Coordinator

Ruth Hazzard, University of Massachusetts Extension Entomology Dept. West, Agricultural Engineering Building Univ. of Mass., Amherst, MA 01003

Phone: 413-545-3696

Fax: 413-545-5858

Email:

rhazzard@umext.umass.edu

Collaborators

Univ. of MA Extension
Hampshire College
Lemelson National Program in Invention, Innovation and Creativity at Hampshire College
Area vegetable farms and farmstands

ACE Grant

\$30,138

Match

\$10,598

Duration

August, 1995 to November, 1997

Project Number

ANE95-26



Project Number
ANE95-26

were used. Bt products gave equal control of ECB compared to conventional materials. Higher numbers of beneficial insects were present in Bt-treated plots than conventional plots following insecticide applications. Eighty-two percent of participants were satisfied with the control they achieved and plan to use Bt in their early corn in the future.

Replicated experiments showed that weekly applications of Bt products were as effective as twice-weekly applications in controlling ECB. The cost per acre of using Bt products is equal to conventional products. The environmental impact as measured by the environmental Impact Quotient (EIQ) is 6.99 for Bt vs. 21.64 for conventional insecticides. An average of 1.0 pt AI/acre of restricted pesticide would be eliminated by adoption of Bt products for early-season ECB control. These results show that Bt products can be integrated into a standard IPM system for ECB control as a direct replacement for conventional insecticides with no extra cost to growers and with positive benefits to the agro-ecosystem.

In late-season corn (harvested in August and September), second-generation European corn borer (ECB) and corn earworm (CEW) cause up to 100 percent damaged ears. Application of an oil/Bt barrier to the silk at the tip of the ear causes mortality to any caterpillars that enter through the silk channel. Oil barrier treatments consistently yielded 2-3 times more marketable ears than untreated controls, with results ranging from 65 percent to 100 percent undamaged ears compared to 18 percent to 87.5 percent clean in controls.

Commercially acceptable levels of con-

trol were achieved in experiments where foliar applications of Bt were used in combination with a direct-silk oil treatment. A hand-held oil applicator was designed and built which reduces the labor required for direct treatment of silks. Growers who tested the oil applicator reported positively on its efficiency. The cost for this late-season biointensive system is \$107 to \$137 per acre compared to \$108 for standard IPM and \$172/acre for conventional, non-IPM management.

This strategy is of greatest interest to organic growers who currently have no method of control for corn earworm and face significant losses due to corn earworm damage. If it proves to be reliable and cost-effective, it will also be of interest to IPM sweet corn growers with 10-15 acres who are seeking alternative methods.

Conclusion

The results of this project are applicable throughout northeastern and central North America, where fresh market sweet corn has a similar pest complex. For growers currently using registered broad-spectrum insecticides, Bt foliar sprays provide an alternative that is no more costly and can be readily integrated into current practice.

For organic sweet corn growers who currently see retail sales decline and are prohibited from wholesale markets, a viable organic method will expand sales, production and profitability.

Reported December 1997.

A Living Lab/Classroom for the Integration of Research and Education Efforts on Alternative Vegetable Production Systems

Vegetable Systems

Summary

During the past five years, we have collected comprehensive baseline data on crop growth and development, soil properties and fertility, disease incidence and damage, insect pressure and damage, produce yield and quality, and costs of agricultural inputs. This project is analyzing four different high-value vegetable crops in five different production systems. The systems include variations of organic and chemical practices, which differ in their approach to soil management and pest control strategies.

Key Findings

We found significant differences in soil conditions between the organic and other main systems, including improvement in soil tilth, greater soil friability, and improved water infiltration. Growth and yield responses accompanied these differences.

Companion cover crops for cabbages could not be recommended over the use of herbicides or cultivation when considering yield.

No correlation was observed between disease severity and tomato production. Comparisons suggest that the loss is fairly close between the treatments.

Compost, as part of a vegetable production system, contributed to greater crop yields in the years following actual application.

Objectives

1. To evaluate the ecological, agricultural, and economic performance of alternative vegetable production systems, as well as single-component variations of these systems.
2. Develop more resource-efficient and environmentally sound management systems for high-value vegetable production by using a focused team approach to investigate complex biological processes and their economic implications.
3. To involve the general public (rural and urban dwellers, legislators, growers, extension agents, students, other researchers) in agricultural research as an integrative, interactive process.

Project Methods and Results

Five production systems were analyzed in 1997. Codes are followed by fertility source and pest control: ORG-OCIA (composted cow manure/Organic Crop Improvement Association guidelines), ORG-CHEM (composted cattle manure/agrichemical), ICM-IPM (hairy vetch + agrichemical/OCIA and agrichemical), CON-CHEM (agrichemical/agrichemical), CON-OCIA (agrichemical/Organic Crop Improvement Association guidelines).

Coordinator

William J. Lamont
Associate Professor of
Vegetable Crops
Pennsylvania State University
University Park, PA 16802

Phone: 814-865-7118
Fax: 814-863-6139
Email: wj11@psu.edu

Collaborator

The Pennsylvania State
University

SARE Grant

\$520,279

Match

\$246,724

Duration

January, 1993 to December,
1997

Project Number

LNE92-32



Project Number
LNE92-32

We collected baseline data on the following: amounts and costs of labor, equipment, and materials; official weather station data; plant growth and development; soil properties and nutrient analyses; arthropod density and damage; pathogen epidemiology and plant damage; plant tissue analysis; yield and grade of produce; and postharvest storability.

Insect populations were monitored weekly in tomatoes, snap beans, and cucumbers. Pheromone and blacklight trap data were used to monitor activity of sweet corn pests. Monitoring data were used to time pest management activities. In tomatoes, we evaluated the effect of a very low rate of imidacloprid on the early establishment of Colorado potato beetle.

Sweet corn insect management was based on pheromone trap catch. This was part of a transition to an integrated pest management program (IPM) based entirely on pheromone trap catches conducted throughout the state of Pennsylvania. Prior to this year, the sweet corn IPM program relied upon blacklight trap captures for monitoring European corn borer and pheromone traps for corn earworm and fall armyworm. Moving entirely to pheromone traps will allow much wider on-farm adoption.

Observations

Vegetable crops planted in the same field year after year break down soil structure and make tillage and planting practices difficult. Improvement in soil tilth, however, was observed upon the incorporation of rye or hairy vetch winter cover crops. This was especially noticeable when the rye cover crop was incorporated at a relatively mature stage of growth—ripening stage in early summer.

Greater soil friability was evident throughout the five-year experiment in the treatments that were compost amended compared to those without amendments. Increased cultivation

proficiency was observed in the amended treatments. The amended treatment with OCIA pesticide practices had a greater number of weed species (including perennials) than the unamended soil treatments. The rotary hoe provided effective weed control in the non-herbicide sweet corn and snap bean crops.

Water infiltration is an important characteristic for any crop producing soil. Average organic soil infiltration rates were well over 1.5 times those of the conventional soil treatments.

Conventionally fertilized soil treatments exhibited rapid early growth. The organic soil treatment appeared to have a delayed growth response different from the conventional soil treatment. Established plants grew slowly at first but exhibited sustained vigor in the later stages of development. Fruit development and ripening of tomato and cucumber was found to be delayed in the organic soil treatment.

Growth of tomato plants in all systems was excellent. Where organic soil practices are combined with synthetic chemical pesticide application yield and quality were highest. Where conventional soil practices are combined with OCIA pest control guidelines (CON-OCIA), yield and quality were lowest.

Straw mulch used in tomato culture may have a deleterious effect on production. An herbicide mulch combination was very effective in suppressing weed species such as common lambsquarters and redroot pigweed.

Outreach

A home page for the SARE project continues on the World Wide Web with monthly updates about the project, a calendar of events and announcements, and links to other sources of information on sustainable agriculture. The project continues to be a classroom for several field biology courses.

Reported December 1997.

Develop Crop Rotational Budgets for Three Cropping Systems in the Northeast

Vegetable Systems

Summary

The Northeastern United States is the most highly urbanized region in the nation. Public concern for both environmental quality and maintenance of a dependable supply of high-quality food presents a challenge for the agriculture of the region. This challenge requires that farming systems be developed and implemented that successfully combine environmentally responsible production methods and management of resources in a manner that enables Northeastern farmers to successfully compete in regional, national, and international markets. Long-run profitability is the ultimate determinant of sustainability.

To test the profitability and productivity of alternative systems the project developed enterprise budgets for a set of crop and livestock enterprises under three defined resource management systems. Eighty-one enterprise budgets for "conventional," "reduced input," and "organic" production systems were developed. An interactive web site hosts these budgets and related information. Results of this study will also be published through the Northeast Regional Agricultural Engineering Service by September 1998.

Objectives

1. To develop enterprise budgets for conventional, reduced input, and organic production systems for the Northeast.
2. To input the enterprise budgets developed into a computerized database so that information on identifying and selecting sustainable practices can be provided.
3. To provide training to field educators that prepares them to assist farmers in selecting alternative sustainable production systems appropriate to individual farm situations.
4. To inform farmers about the relative environmental impact and profitability of alternative systems by providing a selection enterprise budgets for various cropping systems.

Methods

This study developed a database providing an analytical framework for "whole farm" assessment of alternative production practices. Production practices included in the analysis were: "Conventional" — primary reliance upon conventional tillage, commercial fertilizers, and pesticides; "Reduced Input" — reliance on minimum tillage, nutrient balancing, and integrated pest management; and "Organic" — use of no-till and cover cropping to minimize erosion, reduction of pest populations through rotation and use of manures and natural fertilizers, and biological methods of pest control.

Coordinator

Robin G. Brumfield
Agricultural Economics &
Marketing Department
Cook College
Rutgers University
PO Box 231
New Brunswick, NJ 08903-0231

Phone: 732-932-9171

Fax: 732-932-8887

Email:

brumfield@aesop.rutgers.edu

Collaborators

Rutgers University
The Pennsylvania State University
Northeast Organic Farmers
Association of New Jersey
University of New Hampshire
University of Delaware
University of Massachusetts
University of Maryland
University of Vermont

SARE Grant

\$60,846

Match

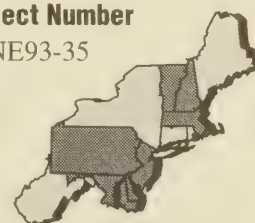
\$159,742

Duration

1993-1997

Project Number

LNE93-35



Project Number

LNE93-35

The database demonstrates production practices, inputs, and crop enterprises that reduce costs, increase net farm incomes, lessen adverse impacts upon the environment and human health, and increase competitiveness. Hence, producers and agricultural consultants can use it to make decisions about cost containment measures, alternative enterprises, resource use and allocation, and optimal crop mix. By being able to directly relate personal performance to those of the typical grower of the same commodity or other value added crops, farmers can plan more effectively.

The database also provides cost and return information valuable to people making key policy decisions about alternative agricultural enterprises. It also can help enhance understanding of the effects of policy changes on production structure and farm performance, and to evaluate the distribution of agricultural costs, revenues and profits by commodity and region.

A World Wide Web site (<http://aesop.rutgers.edu/~farmmgmt/>) was developed to share the enterprise budgets. Other items on this web site are an interactive budget form that any farmer can use to input data and calculate net returns, and links to other web sites containing information on sustainable agriculture, organic farming, enterprise budgets, and other relevant topics. Project results will be published in 1998, through the Northeast Regional Agricultural Engineering Service.

Results

We first developed typical budgets of crops and livestock that are of high eco-

nomic significance in the region. Each budget was constructed within a specific context of assumed farm conditions typical for the crop in the region. These conditions include size of enterprise (acres, number of animals, etc.), slope, soil conditions, fertility, conservation practices, and equipment/technology complement. The budgets are intended to be used as guides to help producers develop costs of production for their particular operation and to make comparisons in producing the crop under conventional, reduced input, or organic systems.

Each of the budgets incorporated a representative set of production practices, on-farm and purchased inputs, equipment technologies, and farm-gate marketing requirements. In all, 81 budgets (37 conventional, 24 integrated crop management, and 20 organic) were developed representing 23 crop and seven livestock enterprises.

Several cooperating farmers and Cooperative Extension integrated crop management specialists and organic working groups provided second-stage evaluations. Typical budgets were adjusted to reflect actual on-farm costs.

Field educators organized and presented similar workshop activities in their home states. At the workshops, farmers learned how each cropping system affected net incomes, productivity, resource use efficiency, costs, and impacts on environmental and human health. Using data from their own farms, participants could then modify the budgets to reflect their own farm situations.

Reported December 1997.

Integrating New Cultivation Technology and Photocontrol of Weeds to Reduce Herbicide Use in Vegetables

Vegetable Systems

Summary

Weed control continues to be one of the most difficult problems encountered in organic vegetable production. This project is studying seven different types of cultivation implements. The potential for combining cultivation with photocontrol to reduce germination of redroot pigweed and common lambsquarters is also being studied. Successful tools and programs that can be readily adopted by growers, at little additional cost are being identified. This project will integrate new and existing weed management techniques that are environmentally responsible and will lead to a reduction in herbicide use.

Key Findings

Cultivation can replace herbicides in short-season vegetable crops such as transplanted broccoli and snap beans and supplement banded herbicides in sweet corn and potatoes. However, environmental conditions, particularly precipitation, can have a negative impact on the timeliness and eventual success of cultivation and can significantly increase a grower's economic risks.

Growers who intend to rely on cultivation for the *majority* of their weed control, must cultivate the first time *before the weeds even appear* (*preemergence cultivation*).

For longer-season crops, growers must be prepared to use strategies other than or in addition to cultivation if yield reductions are to be avoided. Hand weeding may be cost-effective in fresh market vegetable production; it is cost-prohibitive in processing vegetables.

Timeliness is of the essence, whether in regard to the first cultivation event or a later one. If cultivation is missed at the appropriate time, yield reductions are almost guaranteed. Growers are best served if they have the potential to be flexible, having different types of cultivation tools for different stages of crop growth and herbicides for use on an as-needed basis.

Objectives

1. Determine the feasibility and limitations of different types of cultivation implements in snap beans, transplanted broccoli, potatoes, beets, and sweet corn.
2. Determine the effect of weed growth stage on selectivity to flex-time implements.
3. Investigate the potential for photocontrol of weeds common to Northeastern agricultural fields.

Methods and Findings

After three years of cultivation trials in transplanted broccoli, snap beans, sweet corn, and potatoes, research for this project has been completed. The flex-time culti-

Coordinator

Robin R. Bellinder
Cornell University
Dept. of Fruit and Vegetable
Science
164 Plant Science Building
Ithaca, NY 14853

Phone: 607-255-7890

Fax: 607-255-0599

Email: rrb3@cornell.edu

Collaborators

Cornell University
New York farmers

SARE Grant

\$91,546

Match

\$133,128

Duration

February, 1995 to January, 1998

Project Number

LNE94-40



Project Number

LNE94-40

vators, used once and followed by an inter-row cultivation, were able to replace herbicides. While two cultivations could also provide adequate weed control in a mid-season crop such as snap beans, untimely precipitation can cause cultivation failure resulting in reduced yields.

In a long-season crop like potatoes, cultivation alone can also result in yields equal to those with the use of broadcast herbicides, though weed control is less effective. Greater weed populations may reduce potato yields in years of low precipitation or produce large amounts of weed seeds that cause severe weed infestations in subsequent crops. For these reasons, the use of banded herbicides and inter-row cultivation in snap beans and potatoes provides the least risk and greatest economic returns to growers.

Sweet corn, a long-season crop, cannot compete effectively with weeds early in the growing season; therefore, cultivation must be supplemented with banded herbicides. Expected herbicide reductions with banded applications would be 1.25, 6.25, 1.67, and 2.5 lb ai/A for broccoli, snap beans, potatoes, and sweet corn, respectively.

Initial analysis of cost of production data from sweet corn and snap bean grower surveys indicate that cultivation combined with banded herbicides could reduce weed control costs at least \$15/A and \$6/A in snap beans and sweet corn, respectively, without a reduction in yield.

Research trials and experimentation by growers indicate that, to be effective, the flex-tine harrows must be used when weeds are at the two-leaf stage or smaller. The currently available cultivator models are also limited in that they are not appropriate in size for all crop

row spacings and/or cannot be easily adjusted, particularly in wet soils. Overall, it is expected that for long-term economic viability, growers will face less risk if they are flexible and are equipped to use both cultivation and herbicides on an as-needed basis.

An information sheet was published and more detailed research results will be available shortly in the annual publication, "Cornell Vegetable Weed Science Research Results."

Farmer Feedback on Cultivators

In 1997, four growers used the brush hoe and the flex-tine harrows in a variety of vegetable crops and strawberries. They found the flex-tine harrows to be effective in potatoes, carrots, snap beans, sweet corn, and strawberries. These tools did cause significant crop injury and stand reduction, however, depending upon the crop (even crop variety) and stage of crop development.

Additional limitations mentioned by growers were the size and lack of adjustment of the implements. The width of the cultivators works well with the 30-inch row spacing used at the research farm, but many growers use other spacings and/or a variety of row arrangements. With some row spacings, growers found it necessary to overlap passes with the cultivator to achieve adequate weed control, thereby increasing the time required and the cost of cultivation. In some situations, the cultivators could not be used without damaging one or several crop rows.

Nevertheless, growers' experiences suggest that cultivators can provide satisfactory weed control after determining where their use is most appropriate.

Reported December 1997.

Promoting Agricultural Sustainability Through the Use of Rhizosphere-competent Fungi as an Alternative to Soil Fungicide

Vegetable Systems

Summary

In this project, Cornell Cooperative Extension agents worked with area vegetable farmers to determine what growers need to know to effectively use a recently-available biocontrol fungus, *Trichoderma harzianum* 1295-22. The fungus is a strain derived from a common rhizosphere inhabitant and was bred at Cornell to have greater ability to colonize roots and better ability to kill root pathogens. It recently became available commercially under the name "T-22."

Key Findings

Trichoderma can be seen as an insurance against low yields rather than a general yield enhancer. It is especially cost-effective when there is a chance of suboptimal growing conditions (i.e. conditions producing yields less than 5 tons per acre for sweet corn).

Colonization was good on all soils suitable for sweet corn, but liming acid soils could improve colonization.

The return on investment was 10 to 40 fold on sweet corn, depending on the market.

Trichoderma is effective when the daytime soil temperature is above 55°F. Colder soil restricts *Trichoderma* growth and favors pathogens.

Objectives

1. Evaluate delivery methods for *Trichoderma harzianum* strain 1295-22 that are near commercialization to find which is most effective in commercial farming operations. The methods are in-furrow application, seed treatment and cover-crop inoculum.
2. Evaluate the economic impact of different delivery systems.
3. Test additional cover crops for effectiveness in increasing the population of the biocontrol organism so that a broader choice of delivery systems might be identified.
4. Identify properties of Northeastern agricultural soils that affect the ability of *Trichoderma* to colonize crop roots, thereby identifying the most promising places to begin implementation.
5. Identify growth-reducing stresses that are mitigated by *Trichoderma* in addition to its biocontrol properties.

Methods and Findings

We determined the role of several parameters that growers need to be concerned about, using sweet corn as a model. The parameters were application method, financial return, interaction with cover crop, soil type, and soil temperature.

Coordinator

Thomas Björkman, Associate Professor
Department of Horticultural Sciences
Cornell University
Geneva, N.Y. 14456

Phone: 315-787-2218

Fax: 315-787-2216

Email: tnb1@cornell.edu

Collaborators

Cornell University and
Cooperative Extension
Rodale Institute Research Center
New York farmers

SARE Grant

\$123,801

Match

\$148,444

Duration

September, 1994 to April, 1998

Project Number

LNE 94-43



Project Number

LNE 94-43

The product is inexpensive to use on corn because of the small amount of inoculum necessary. The return on investment was 10 to 40 fold on sweet corn, depending on the market.

The study of soil requirements for colonization showed that all soil types supported high populations of *Trichoderma* on roots inoculated with T-22. Wild *Trichoderma* have much lower populations and are more sensitive to soil type. Roots growing in soils high in calcium are better colonized.

The minimum useful temperature for *Trichoderma* was lower than expected. There is no problem at 55°F or above. Although overwintered or early-spring crops may give unsatisfactory colonization, T-22 is useful at any temperature appropriate for sowing sweet corn.

Research on this and other crops has shown a clear pattern of what to expect from *Trichoderma*. The yield enhancement is primarily seen when plants in a well-managed soil are weakened by stress. *Trichoderma* restores their original vigor. The yield-reducing conditions encountered in this study were water stress, early planting or harvest, moderate nitrogen fertilizer, and low plant population. In all these situations, greater root growth has obvious value.

However, *Trichoderma* did not work if the field was flooded or crusted because both roots and fungi need air to grow. The restorative effect occurs when control yields are reduced below a threshold amount. It occurred when untreated sweet corn yielded less than 5 tons/acre near the threshold yield, the increase was about ten percent; with greater stress

Trichoderma increased yields by fifty to one hundred percent.

Crop protection against root rots cannot be obtained with any pesticide in the Northeast. *Trichoderma* does not protect against seed rots, so its use complements fungicide seed treatments, it does not substitute for them. While use of *Trichoderma* for this purpose will not reduce pesticide use through replacement, it is an important non-pesticide management tool to prevent a serious disease of crops.

In areas where soil fumigation with methyl bromide is practiced, a multi-component system of controls will be needed to continue producing several crops after that material becomes unavailable in a few years. *Trichoderma* is likely to be a very useful component of such systems, and the knowledge gained in this research will be of great value in making it possible to integrate it successfully during the transition.

The delivery system is easy to use by family farmers and small producers. The response primarily favors low- and moderate-input farming that uses an active soil health management program. T-22 application is of particular value in organic management.

Better root growth of T-22 colonized roots should allow the plant to capture more soluble nitrogen and phosphorous that would otherwise leach to the ground water, thus preventing a process that is both wasteful of resources and detrimental to water quality. In addition, use of a biocontrol fungus is one more element that will increase farmer awareness of the active management of soil microflora.

Reported December 1997.

Management Strategies for Improved Soil Quality with Emphasis on Soil Compaction

Vegetable Systems

Key Findings

Soil compaction is a common problem in many vegetable farms in the Northeast because farmers frequently must enter the field with heavy equipment under wet soil conditions. Compaction can reduce yields of vegetable crops by thirty to seventy percent. Secondary effects of compaction, such as prolonged flooding, and more severe insect and weed pressure, contribute to yield losses, and also can result in increased use of fungicides, pesticides and herbicides.

This project is identifying specific soil management practices that reduce root disease and soilborne pathogen pressure.

The best rotation in terms of highest yields in this final year tended to occur in those plots planted to either sudangrass or hubam sweet clover the first summer, planted to sweet corn in the second summer, and with either the yellow mustard or bare ground control fall/winter cover crop treatments in between.

The lowest yields tended to be in those plots planted to beans in the summer of 1995 and/or 1996, and with the rye/vetch or perennial ryegrass fall/winter cover crops in rotation.

In contrast to the positive effect of chicken manure compost on yield of table beets at this site reported last year, in 1997 the compost had no significant effect on sweet corn yield and a significant negative effect on snap bean yield.

The results of the greenhouse studies tend to confirm our field observations that sudangrass is particularly beneficial in compaction remediation, and perennial ryegrass and yellow mustard can also be effective.

Objectives

- 1 Evaluate several winter cover crops, rotation crops, and cropping sequences for their effect on soil quality and soil compaction.
- 2 Identify and integrate effective mechanical procedures for remediation of compaction with bioremediation approaches.
- 3 Quantify the relationship between soil management practices and the occurrence of soilborne pathogens and severity of root disease.

Methods and Findings

This was the third year of our multi-site field study evaluating various cover crops, rotation cycles, compost, and deep tillage for their impact on soil compaction, soil quality and cash crop yield. At the replicated Freeville site the entire field was

Coordinator

David W. Wolfe
Assoc. Professor, Department of
Fruit & Vegetable Science
Cornell University
Ithaca, NY 14853

Phone: 607-255-7888

Fax: 607-255-0599

Email: dww5@cornell.edu

Collaborators

Cornell University and
Cooperative Extension
New York vegetable growers

SARE Grant

\$130,000

Match

\$378,755

Duration

February, 1995 to February, 1998

Project Number

LNE94-44



Project Number

LNE94-44

planted in snap beans in the summer of 1997 as our "assay" crop to evaluate the cumulative and integrated effect of 64 tillage/rotation sequence treatments on soil quality and yield potential.

There was no significant residual effect on yield from the deep tillage treatment applied in the first year (1994) of the study

The negative effect on 1997 snap bean yields due to a residual effect from beans planted two years before (1995) was statistically significant. The relatively low yield in plots with beans followed by beans, and in the plots with prior rye/vetch and perennial ryegrass cover crops was associated with more root rot severity. We suspect that part of the negative effect of the cover crops was insufficient delay between cover crop incorporation and seeding of the snap beans (only about a week).

At the replicated Geneva site, yield of 1997 sweet corn planted after beets was significantly higher than that of corn planted after corn. Yield of 1997 snap beans at this site tended to be higher in plots in which a rye fall/winter cover crop treatment was used, and were also higher in the hairy vetch plots, even though the vetch did not overwinter. There

was no significant treatment effect on root rot severity. However, root rot severity has been increasing in the continuous bean rotation and has had some negative effect on yield.

In contrast to the positive effect of chicken manure compost on yield of table beets at this site reported last year, in 1997 the compost had no significant effect on sweet corn yield and a significant negative effect on snap bean yield. An explanation for the variability in response to this compost between crop species, years, and sites will require additional study.

In a greenhouse study, an evaluation of eight cover crop species found that perennial ryegrass and sudangrass species had the greatest capacity for root growth into compacted soil layers, and these species also had the fastest overall plant growth rate on compacted soils.

In a second greenhouse study, yellow mustard or sudangrass did the best job of remediating soil compaction.

Results from the project have been incorporated in several places into a new book on cover crops (*Best Cover Crops For Sustainable Farming*, Andy Clark, USDA Sustainable Ag Network).

Reported December 1997.

Presidedress Soil Nitrate Test for Fall Cabbage

Vegetable Systems

Summary

Efficient use of N fertilizer is important to achieve optimum crop yield, farm profitability, avoidance of water pollution, and conservation of natural resources. The Presidedress Soil Nitrate Test (PSNT) is commonly used to improve N management in field corn and sweet corn. Fall cabbage is planted after harvest of spring vegetable crops such as sweet corn, snap bean, and lettuce. These crops often leave significant amounts of carryover N in the soil. The PSNT may be useful to improve N management with fall cabbage (or other cole crops) grown as a "catch crop" to utilize residual N. Our 2-year study is evaluating the PSNT for use with fall cabbage and determining the effectiveness of cabbage for utilization of carryover N from spring crops. Implementation of the PSNT by vegetable growers on an additional crop is expected to improve N recommendations, reduce nitrate leaching losses and enable more efficient, economically viable crop production.

Key Findings

The PSNT appears to have potential as a tool for predicting the need of fall cabbage for sidedress N and significantly reducing production cost. When sidedress N is not needed, the potential savings for cabbage is about 150 lbs. N/acre or \$30.00/acre.

Indications are that cabbage is an effective crop for removing residual N from the soil, thus reducing the potential for movement of residual soil nitrate into groundwater.

Preliminary results indicate that the PSNT may be useful on crops other than corn, the crop for which this soil test was originally developed.

Objectives

1. Evaluate the usefulness of the PSNT to accurately identify N responsive and non-responsive fields planted in fall cabbage.
2. Measure fall cabbage yield response to fertilizer N rates following harvest of early season crops such as sweet corn, snap bean, or lettuce.
3. Measure recovery of residual mineral N from soil by fall cabbage.

Methods and Findings

Twenty-six field experiments to calibrate the presidedress soil nitrate test (PSNT) for use with fall cabbage were conducted in three states (New Jersey, Delaware, Connecticut). Cabbage yield response for each site appear to be closely related to the PSNT values. Most field sites had low PSNT values due to excessive rainfall. PSNT values less than 15 ppm NO₃-N exhibited significant cabbage

Coordinator

Dr. Joseph R. Heckman
Rutgers University,
Department of Plant Science
58 Dudley Road
New Brunswick, NJ 08901-8520

Phone: 732-932-9711 ext. 119

Fax: 732-932-9441

Email:

heckman@aesop.rutgers.edu

Collaborators

Rutgers University
University of Connecticut
University of Delaware
Farmers in Connecticut,
Delaware, and New Jersey

SARE Grant

\$45,000

Match

\$73,936

Duration

January, 1996 to June, 1997

Project Number

LNE95-56



Project Number
LNE95-56

head yield responses to sidedress N fertilizer. PSNT values greater than 30 ppm exhibited no response to sidedress N.

Results already suggest that the PSNT should be useful to predict the need of cabbage for sidedress N. However, additional calibration data is needed, especially from sites having PSNT values in the range of 15 to 30 ppm.

Total N uptake for fall cabbage may be as high as 190 lbs. N/acre. This indicates that cabbage is an effective crop for removing residual N from the soil.

Most of the field trials followed the harvest of an early sweet corn crop. Three trials were planted on summer fallowed land. The weed control program for sweet corn used herbicides that would allow the fields to be cropped to fall cabbage. The sweet corn plant populations averaged 22,000 plants/acre. Nitrogen fertilizer applied to the sweet corn included 20 lbs. N/acre with the corn planter and 100 to 150 lbs. N/acre sidedressed when plants were about 12 inches tall.

After the fields were completely harvested of marketable ears, the corn stalks were chopped and plowed under to prepare the soil for cabbage. Fertilizer was broadcast at 100 lbs. K/acre, 50 lbs. S/acre, and 2 lbs. B/acre and incorporated with tillage. Cabbage (CV. Blue Bayou) bedding plants were grown in the greenhouse before being transplanted to the field between August 1 to 15.

While in the greenhouse the bedding plants were fertilized weekly with Miracle-Gro 15-30-15 and one final application was made immediately before transplanting into the field. Zero N fertilizer was applied to the field soil at the time of transplanting.

Between two and three weeks after the cabbage was established in the field, PSNT soil samples were analyzed for nitrate and ammonium. Sidedress N rate treatments (0, 40, 80, 120, 160 lbs. N/acre) were applied following PSNT sample collection. Cabbage heads were harvested in late October and early November.

Reported December 1997.

Working Towards Implementation of a Disease Forecasting System for Fresh Market Tomatoes in Northern New Jersey

Vegetable Systems

Summary

Forecasting for tomato disease control in northern New Jersey has been under evaluation since 1991. The basic premise behind disease forecasting in crop production is that fungicides are applied "as needed," when disease development is likely, rather than by conventional calendar-based scheduling. This allows for the reductions of chemical inputs while maintaining crop quality and yields. The benefit to growers is lower production costs. The environment benefits in reduced pesticide applications during crop production. This project continues to evaluate and develop use of the TOM-CAST forecast system for tomato production in Northern New Jersey.

Key Findings

The 1997 trial provides important evidence that disease forecasting is a viable approach to disease control even under heavy and diverse disease pressure.

The 1997 research confirmed that important fungal diseases affecting New Jersey's tomato crop can be controlled and marketable yields sustained under dramatically reduced fungicide regimens.

During five years of field trials, fungicide applications were reduced by over 75 percent with no adverse impact on disease control or marketable yields.

Objectives

1. Evaluate disease forecasting as an alternative approach to disease control for fresh market tomato production in northern New Jersey by:
 - a. conducting field research to specify thresholds for using the TOM-CAST system in northern New Jersey under different seasonal weather conditions;
 - b. evaluating the impact of reduced fungicide applications with TOM-CAST on postharvest fruit quality;
 - c. expanding the data base for evaluating the economic impact on tomato production of using disease forecasting (TOM-CAST) as an alternative approach to disease control.
2. Continue developing software for weather data collection and forecasting; evaluating weather monitoring equipment; and standardizing equipment use procedures.
3. Investigate an electronic meteorological service as an alternative to on-site weather monitoring.
4. Continue grower research demonstrations.
5. Generate the information, including economic data, needed to determine how disease forecasting might best be implemented by individual growers or provided by organizations such as grower cooperatives or by programs such as Rutgers' vegetable IPM program.

Coordinator

Winfred P. Cogwill, Jr.
Rutgers Cooperative Extension
of Hunderton County
4 Gauntt Place
Flemington, NJ 08822

Phone: 908-788-1339

Fax: 908-806-4735

Email:

cowgill@aesop.rutgers.edu

Collaborators

Rutgers University
New Jersey farmers

SARE & ACE Grants

\$54,210

Match

\$114,730

Duration

December, 1996 to July, 1998

Project Numbers

LNE95-59 and ANE96-30



Project Numbers

LNE95-59
and ANE96-30

Methods and Results

The TOM-CAST forecast system has been shown to have important advantages over other systems. It is more “user friendly” and maximizes reductions in spray schedules while providing adequate disease control. The 1997 SARE/ACE research trial, conducted at the Rutgers Snyder Research and Extension Farm, focused on confirming the decision thresholds for using TOM-CAST in northern New Jersey and evaluated fungicides and combinations of fungicides for use with TOM-CAST.

Disease control comparable to that with Bravo 720 (a general use tomato fungicide) used on a seven-or seven-to-ten-day schedule was provided by the TOM-CAST system. In addition, TOM-CAST provided control information comparable to the use of Bravo 720, Champ 2F plus Bravo 720 or Manzate 200DF then Bravo 720, a reduced cost program used by many tomato growers. Champ used with TOM-CAST was not as effective as the conventional Bravo regimen. As few as five TOM-CAST scheduled applications resulted in total and marketable yields statistically equivalent to yields resulting with 13 to 17 conventionally scheduled applications.

Under research trial conditions of high disease pressure (which included two common bacterial diseases and powdery mildew, a fungus disease new in New Jersey), most materials controlled disease in conjunction with TOM-CAST schedules which reduced the number of sprays by as much as 70 percent. Postharvest decay was not increased when the number of sprays was reduced.

The 1997 research trial again demonstrated that disease forecasting for tomatoes is a

sustainable alternative approach to disease management in tomato production in northern New Jersey. Under 1997 conditions, as much as 27 lb. per acre of fungicide active ingredient (assuming use of Bravo 720, 3 pt/acre) could have been eliminated from tomato production using the TOM-CAST forecast schedule.

Disease forecasts were available to tomato growers in northwestern New Jersey in 1997. Twenty-one growers were directly contacted and trained in the use of TOM-CAST. Early results from a survey of grower's response to this service indicate that growers' use of TOM-CAST ranged from regular use to no use. Reasons varied from grower to grower.

Several years' evaluation by Rutgers' researchers of forecasters developed for fungus disease control on tomato have demonstrated that reducing disease control inputs is possible. Benefits would accrue to the grower in lower production costs and to the environment in reduced amounts of pesticide applied during crop production. On average, for five years of field trials, fungicide applications were reduced by 76 percent with no adverse impact on disease control. On average for the same five years, fungicide applications were reduced by 78 percent with no adverse impact on marketable yields. Over the last five years a grower would have eliminated 130 lb. per acre of fungicide active ingredient (assuming use of Bravo 720, 3 pt/acre) from production inputs. Extrapolating to the 300 acres of fresh market tomatoes grown in northern New Jersey (1995 data), almost 20 tons of pesticide would have been eliminated from crop production over that time period.

Reported December 1997.

Demonstrations of Sustainable Vegetable Pest and Crop Management: Fresh Market Sweet Corn

Vegetable Systems

Summary

The overall goal of this project is the education of farmers, extension specialists, extension agents, agribusiness people, and consumers about the need to adopt sustainable integrated pest management (IPM)/integrated crop management (ICM) production techniques. It focuses on fresh market sweet corn for the proposal period, but is part of an on-going vegetable education.

In this phase, four sweet corn pest and crop management systems (organic, IPM/present, IPM/future, and conventional) have been implemented on grower farms and on a university research farm.

Key Findings

Generally the conventional and IPM future plantings resulted in the highest net return per acre in dollars. The organic system resulted in the lowest environmental impact when measured in four different ways.

Adoption of IPM techniques have the potential to keep growers at least as profitable as they are using conventional techniques.

Continued adoption of IPM and organic practices described in these systems have the potential to reduce environmental impact (as measured by the EIQ) by at least 50 percent based on the first years' results.

IPM labeling has the potential to increase adoption of IPM techniques in fresh market sweet corn from a 40 to 70 percent level up to an 80 to 100 percent level.

Objectives

1. On growers' farms demonstrate to farmers, extension specialists, extension agents, and agribusiness people the economic and environmental benefits of adoption of various IPM/ICM techniques as part of a more sustainable approach to vegetable production.
2. At New York State Agricultural Experiment Station (NYSAES) at Geneva conduct one demonstration site to compare all defined pest management systems for fresh market sweet corn.
3. Collect and evaluate pest, pesticide use, economics, environmental impact, yield, and quality data to compare the systems at the farm sites and the university site.
4. Publicize the results of the comparisons through field days, presentations at grower meetings, and conventional and electronic publications.
5. Work with a major supermarket and its growers to implement sustainable practices for fresh market sweet corn; identify the corn to consumers as produced using IPM/ICM practices.

Coordinator

Curtis Petzoldt, Assistant
Director IPM Program and
Vegetable IPM Coordinator
Cornell University, IPM
Program
NYSAES
Geneva, NY 14456

Phone: 315-787-2206
Fax: 315-787-2360
Email: cp13@cornell.edu

Collaborators

Cornell University and
Cooperative Extension
New York State Agricultural
Experiment Station
Wegmans Food and Pharmacy
Central NY Crop Management
Association
New York farmers

SARE Grant

\$164,356

Match

\$99,171

Duration

January, 1997 to March, 2001

Project Number

LNE96-67



Methods and Findings

Four sweet corn pest and crop management systems (organic, IPM/present, IPM/future, and conventional) were defined and implemented on grower farms and on a university research farm. The first years' results showed differences among the four systems in terms of economics, pest control efficacy and environmental impact. Generally, the conventional and IPM systems were the most profitable while the organic system showed the least environmental impact.

In grower fields, the IPM/future treatment insect management strategy was modified to include the use of *Trichogramma ostrinae* and *Bacillus thuringiensis* (Bt) for European corn borer (ECB) management. Pheromone traps for ECB, corn earworm (CEW) and fall armyworm (FAW) were placed near each field to help determine optimal release times for the *Trichogramma* as well as the most effective Bt product for the pest complex present.

The organic system was not implemented in grower fields in 1997. Rather than assume that organic growers encounter the same problems and pests as conventional and IPM growers of sweet corn, a survey of organic sweet corn growers was conducted to identify major problems and pests associated with organic production. Based on the results, we plan to address organic grower's pest management needs by demonstrating releases of *Trichogramma ostrinae* for ECB control and to address nutrient management needs by loaning growers Cardi meters to help them track nitrogen release in different parts of their rotation. The other nutrient management needs identified are beyond the

scope of this project, but will be brought up as extension needs to be addressed by the wider system.

Grower fields also presented the opportunity to test distress-call-based bird scare devices since several growers had fields with bird pressure.

In cooperation with Wegmans supermarkets, consumers were informed of IPM practices on sweet corn. As part of this effort, an IPM educational video was produced by Wegmans Food markets and shown on local television and in stores. Stores that sold corn grown with IPM methods and marketed with the IPM label had increased sales of nearly 15 percent over stores selling corn grown and marketed conventionally. However, store produce managers felt that increased sales were likely a result of their efforts with displays and not necessarily due to increased awareness of IPM corn.

Recommendations to Date

- Band herbicides and replace at least some herbicide use with cultivation.
- Use cover crops as a nutrient source and for weed management.
- Test *Trichogramma* wasps and Bt's for European Corn Borer control.
- Use resistant varieties or new safer fungicides if rust control is needed.
- Scout for all pests before a pesticide is used.
- Use lowest environmental impact pesticides.
- Conserve beneficial insects by minimizing insecticide applications.

Reported December 1997.

At-Harvest Stalk Nitrate Testing for Sweet Corn

Vegetable Systems

Summary

This project has developed a simple diagnostic test to evaluate crop N status at the time of harvest. The at-harvest stalk test (AHST) will help growers evaluate new practices and learn more from field observations related to N fertility management.

At-harvest stalk tissue testing is of little value in the current season. However, the knowledge gained from several years of testing should enable growers to determine if their N fertility program is on target or needs adjustment.

The at-harvest stalk N test may be used along with the presideress soil nitrate test (PSNT). The results of the at-harvest stalk tissue test may help growers gain increased confidence in the accuracy of the PSNT recommendations.

Nitrogen fertilizer recommendations based on the PSNT are generally reduced about one-third on average compared to growers' usual practice.

Objectives

1. To determine the below-optimal, optimal, and above-optimal concentrations of nitrate in the basal portion of sweet corn stalks sampled at harvest.
2. To evaluate the at-harvest stalk nitrate test as an indicator of sweet corn crop N status.
3. To use the at-harvest stalk nitrate test to help sweet corn growers evaluate sustainable N fertility management practices such as the PSNT.

Method and Results

The at-harvest stalk test (ASNT) was developed to give growers a simple diagnostic test to evaluate crop N status. It indicates whether an inadequate, optimal, or excessive amount of N fertilizer was applied. Stalk NO₃-N concentrations less than 9000 ppm are considered N deficient and under fertilized. Concentrations of NO₃-N between 9000 and 13000 ppm have a marginally deficient N status, and between 13,000 and 15,000 ppm the N status is optimal. Concentrations of NO₃-N above 15,000 ppm are above optimal and indicate that sweet corn was over fertilized with N.

Over 60 field experiments were conducted to examine the relationship between sweet corn yield and the nitrogen status of corn stalk tissue sampled at the time of harvest. When the stalk NO₃-N concentration was less than 8,000 ppm, sweet corn yield was generally less than 90 percent of maximum yield. When the stalk NO₃-N concentration was above 13,000 ppm, yield was generally greater than 90 percent of maximum yield.

Coordinator

Dr. Joseph R. Heckman
Department of Plant Science
Rutgers University,
59 Dudley Road
New Brunswick, NJ 08901-8520

Phone: 732-932-9711 ext. 119

Fax: 732-932-9441

Email:

heckman@aesop.rutgers.edu

Collaborators

Rutgers University
New Jersey farmers

SARE Grant

\$4,710

Match

\$14,144

Duration

January, 1997 to December, 1998

Project Number

LNE96-73



Project Number

LNE96-73

The optimal percent N concentration range in sweet corn stalk tissue appears to be between 1.8 and 2.2 percent N. Corn plants with stalk N concentrations less than 1.8 percent generally produced less than 95 percent of maximum yield. Stalk N concentrations greater than 1.8 percent were associated with yields better than 90 percent of maximum.

The same experiments used to study stalk N status also measured the soil NO₃-N concentration (PSNT) when the plants were 8 to 12 inches tall. PSNT soil test values less than 25 ppm indicate that soil N supply during the growth of the sweet corn is probably not adequate and that sidedress N fertilizer should be applied. PSNT values of 25 ppm or greater indicate that the soil N supply is adequate.

The relationship between the presidedress soil nitrate test and the at-harvest stalk N test were found to be complementary. Although the PSNT samples were taken early in the season, and the AHST on the day of harvest, the different tests have agreeable results. When the soil NO₃-N concentration was above 25 ppm as measured by the PSNT, the stalk NO₃-N and percent N values were in or above the optimal range. In other words, following a no-sidedress N recommendation, when indicated by the PSNT, has a low risk of later causing the crop to become N

deficient. The ASNT can be used to inspire grower confidence in the PSNT.

Although information gained from at-harvest stalk tissue sampling is of no value to the current sweet corn season, its use repeatedly over several seasons should indicate to growers whether they tend to under fertilize or over fertilize their crop. This information may then be used to fine tune N fertility management for future seasons.

The cost of performing the at-harvest stalk tissue test is minimal. The tools required include a ruler, sharp knife, paper bag, marking pen, box to mail the samples, and postage. The samples must be sent to a laboratory capable of stalk nitrate or Kjeldahl analysis. The cost per sample is typically \$5.00 for nitrate analysis or \$6.00 for total Kjeldahl N.

Recommendations to Date

Growers should be prepared to adopt this new technology once it is fully implemented by extension in 1998. They should keep careful records of their N fertility practices and the results of the at-harvest stalk N test for at least two or three seasons. If their stalk samples consistently do not test near the optimum range for N, they should be prepared to make appropriate adjustments in their N fertility program.

Reported December 1997.

Biological and Cultural Methods of Insect Management in Vegetables: Conference & Publication of Proceedings

Vegetable Systems

Summary

Drawing on both scientific research and experiential information from farmers, participants will hold a conference create a handbook for vegetable farmers that presents biological and cultural methods of insect management as they are currently being used by organic farmers.

Objective

Produce a farmer-friendly publication for insect management using biological and cultural strategies and methods. This will include information from summaries of scientific and extension literature on biological and cultural insect management. The collected information will be reviewed, then evaluated by a farmer/scientist conference of specialists in vegetable insect management, Connecticut organic vegetable growers, and innovative vegetable growers from other states in the Northeast.

Abstract

Where can vegetable farmers go for information on alternatives to pesticides for managing insect pests? There are two important sources of this information: organic farmers and scientific research. We will collect information for farmers on strategies and techniques for managing insects using biological and cultural control methods. This information will be collected in three ways: a survey of all organic vegetable farmers in Connecticut; case studies of eight to ten of these farms, which will include farmers' methods and scientific observations of the resulting pest densities; and summaries of scientific and extension literature on biological and cultural insect management.

The information collected will focus on methods of providing resources and habitat for naturally occurring biological control agents in order to maximize their effects on pests; cultural methods (such as early or late planting, specific crop rotations, barriers, mulching, living mulches, intercropping, or trap cropping) that have proven effective against particular insect pests; insect resistant varieties; and nutritional deficiencies or excesses that have been shown to affect insect abundance or damage.

The information will be reviewed and evaluated at a farmer/scientist conference including: specialists (research and extension) in vegetable insect management, Connecticut organic vegetable growers, and innovative vegetable growers from other states in the Northeast. All the information and the resulting evaluations will be published as a handbook for farmers, and as a database on the Internet.

Approved for funding March 1997.

Coordinator

Kimberly Stoner
Connecticut Agricultural
Experiment Station
PO Box 1106
123 Huntington St
New Haven, CT 06504

Phone: 203-789-7246

Fax: 203-789-7232

Email: Kstoner@caes.state.ct.us

Collaborators

Connecticut Agricultural
Experiment Station
Appalachian Hardwood Center
WVU Extension Service
WVU College of Agriculture and
Forestry
American Woodmark Corporation

SARE Grant

\$20,000

Match

\$21,910

Duration

Two years

Project Number

LNE 97-82



Nitrogen Management for Pumpkins and Squash

Vegetable Systems

Summary

Through on-farm and research station trials in New Hampshire, New York and Connecticut, this project will establish a critical nitrate concentration for the presidedress soil nitrate test (PSNT) for pumpkins and squash. The goals are to help farmers achieve maximum profit, maximum yield and minimum environmental impact. The available evidence suggests that current N recommendations for pumpkins and squash are higher than necessary.

Objectives

1. Establish a critical nitrate concentration for the presidedress soil nitrate test (PSNT) for pumpkins and squash.
2. Aggressively advocate the adoption of PSNT to determine N requirements for pumpkins and squash.
3. Evaluate the usefulness of stem nitrate concentrations and soil nitrate concentrations at harvest to determine excess N availability to squash.

Abstract

Nitrogen (N) fertilizer is a non-renewable resource that is used in large quantities to grow pumpkins. New tools have been developed to improve N management for field and sweet corn. These tools the pre-sidedress soil nitrate test (PSNT) —end-of-season cornstalk test and at-harvest soil nitrate test — could be used to improve N management for pumpkins. More efficient use of N fertilizer would reduce the dependence of agriculture on non-renewable resources, improve environmental quality, and increase the profitability of pumpkin production.

The PSNT is widely used by field corn and sweet corn growers. A number of farmers (six to eight growers) in New Hampshire and Connecticut have used the PSNT to guide N sidedress applications for pumpkins. The results from use of the test by these growers suggests that information provided by the test can substantially reduce N applications in pumpkins. Establishment of an appropriate critical concentration of nitrate is needed before use of the PSNT can be recommended for pumpkins.

There is evidence that current N recommendations for pumpkins are too high and that excess fertilization of pumpkins reduces yields. Excess fertilization of corn can be estimated by measuring soil nitrate concentrations at harvest or nitrate concentrations in the lower cornstalk at physiological maturity. At-harvest soil nitrate concentrations and nitrate concentrations in the lower stem of pumpkins at maturity also should be useful indicators of excess N availability to pumpkins.

Approved for Funding March 1997.

Coordinator

Richard Ashley
University of Connecticut
Department of Plant Science U-67
Storrs, CT 06269

Phone: 860-486-3438

Fax: 860-486-0682

Email:

rashley@canrl.cag.uconn.edu

Collaborators

Connecticut Extension System
University of New Hampshire
Hillsboro County (NH)
Extension
Cornell Cooperative Extension

SARE Grant

\$63,008

Match

\$52,438

Duration

2 years

Project Number

LNE97-83



Enhancement of Sustainable Pest Management with Banker Plants and Colored Mulches in Greenhouses

Ornamentals

Summary

This project is studying ways to use different colored plastic mulches in greenhouses to better manage beneficial insects that prey on agricultural pests. It is also investigating the use of “banker plants” to grow an on-site supply of beneficial insects and build a sustainable biocontrol system.

The use of colored mulch in commercial tomato production has resulted in the elimination of synthetic insecticides. This first year study indicates that insect populations can be manipulated with mulch color.

Yield increases ranging from five percent to 15 percent can be expected from plants grown on the colored mulch compared to plants grown on the standard black mulch.

Objectives

1. Evaluate the effect of polyethylene mulch color in a greenhouse environment on crop and pest response.
2. Develop a strategy to utilize banker plants as a distribution method for natural enemies in commercial greenhouse production.

Method and Findings

Colored plastic mulches (blue, red, silver, yellow) were used in a commercial greenhouse tomato operations to examine their effect on insect development and crop yield over a seven-month crop cycle. Black polyethylene plastic was used as a standard. The tomato plants (variety, Trust) were grown in drip irrigated, raised beds (troughs) which were covered with the colored plastic mulch.

Insect population levels were observed with all colors; however, greater densities of insect pests developed on certain colors. Yellow was most attractive for aphid development, while the blue mulch attracted more thrips. Natural enemies of these insect pests were observed first on these colors and control was achieved more quickly. In essence, the colored troughs serve as a trap crop for specific pests. Although levels of pests were dense on these colors, biological controls were effective in searching and reducing populations on these specific colors.

The total marketable yield for this variety was highest from plants grown on the blue mulch and lowest from plants grown on the silver mulch.

The “banker plants” or plants that serve as a host for the establishment of insect pests and the appropriate biocontrol is under development. A colony of *Encarsia formosa*, the parasitoid used to control greenhouse whitefly, was successfully established. Efforts are currently being directed at developing a colony of *Aphidius matricariae* to control green peach aphid. The banker plants will be

Coordinator

Michael Orzolek
Pennsylvania State University
203 Tyson Building
University Park, PA 16802

Phone: 814-863-2251

Fax: 818-863-6139

Email: mdo1@email.psu.edu

Collaborators

Pennsylvania State University

SARE Grant

\$144,774

Duration

September, 1996 to August,
1999

Project number

LNE96-70



Project number
LNE96-70

used in the future as a distribution method for natural enemies in commercial operations.

Further development of these systems will provide growers with an on-site, “sustainable” supply of biocontrols as they are needed. The supply can be maintained continuously in a commercial operation. This will reduce the need to buy biocontrols from insect-rearing facilities and reduce the cost of using biological control. This production method provides insurance for the grower against sudden pest outbreaks, since crops can be treated immediately without worrying about delays in shipping, no shipments or poor viability of biocontrols when they arrive.

The use of colored mulches and banker plants in greenhouse operations has many positive and long-term implications. In addition to elimination and/or reduction in pesticide use, a greater return per unit may be realized. Better understanding of these systems will augment the effectiveness of other IPM strategies and may serve as a catalyst for increased adoption of IPM in greenhouse operations throughout the nation. The development of these pest control strategies will assist growers in complying with the increasingly restrictive worker safety protection laws, food safety issues relating to pesticide residues, loss of pesticide registrations, and insecticide-resistant pests.

Reported December 1997.

Farmer Projects: Reports from the Field

Since the SARE program launched its Farmer Grant Program in 1993, many people have contacted us with questions about individual projects as well as the program itself.

Their curiosity makes sense. More than 150 producers in the region are managing projects that test or demonstrate alternative production and marketing strategies.

Brief summaries of some of these projects follow. As you read them, you'll notice that some of the projects were successful, while others didn't turn out quite the way the farmers had expected.

In some cases the pests didn't comply — producers wanted to test alternative control measures but pest pressure was insufficient to find out if the controls would have been effective. Or the weather was extreme — so wet, dry or cold that they interfered with the plan of work.

In a few other cases, farmers found out that the alternative treatments they were testing were no better than the control.

"That's important and useful information too," says Northeast Region SARE Coordinator Fred Magdoff. When project results show that a particular method isn't effective — at least under the specific conditions of the project — knowing that information can be useful to other people experimenting with similar strategies.

Magdoff also cautions that it is important to remember that farmer projects vary significantly in their methods and scope. Some are primarily demonstrations while others involve replicated experiments.

If you're interested in more information about any of the projects described here, please send a request, including the project number, to SARE, Hills Building, University of Vermont, Burlington, VT 05405-0082. Or email bholtzma@zoo.uvm.edu. Be sure to include the project number.

Agronomic Systems

Donald Fitzpatrick, of Houlton, **Maine**, experimented with composted paper mill residue as a mulch and soil amendment on his **potato farm**. His goals were to improve weed control, improve soil aggregation and darken and therefore warm the soil. The treatment appears to have had little or no effect on tuber set or yields, which averaged around 12.4 tons per acre. Weather and light weed pressure, however, may have confounded the results, and Fitzpatrick said he plans to try the experiment again.

Fitzpatrick used a modified lime spreader to apply the compost to four plots on at the rate of 10 tons of dry matter per acre. He kept four other plots as controls.

Farmer projects vary significantly in their methods and scope. Some are primarily demonstrations while others involve replicated experiments.

Farmer Projects: Reports from the Field

The mulch was applied as the potato seedlings began to emerge. Control and mulched plots were both treated with Gramoxone, for weeds, just prior to emergence; later the control plots also received a treatment of Sencor herbicide. The control plots were hilled twice, and the mulched plots once.

Canopy closure, which tends to proceed faster when there are fewer weeds, appeared to be slightly better in the mulched plots; although the role of the mulch is unclear because both treatments and controls experienced only slight weed pressure this year. The treatment had little or no effect on yields, which averaged around 12.4 tons per acre; similarly little effect was observed on tuber set.

Fitzpatrick says that the experiment was carried out during an exceptionally rainy summer. Petiole nitrate levels were extremely low, possibly because the rain washed mineralized nitrogen out of the soil. Low levels of plant-available nitrogen may have stunted plant growth, and thus confounded the treatment effects. FNE96-127

- James Barney, of Sherman, **New York**, with the help of crop consultant Daniel Steward, compared four different **perennial forage cropping systems** as alternatives to alfalfa and silage corn for dairy farmers who have relatively heavy, poorly drained soils. They found that intensively managed grasses had the lowest production costs in poorly drained areas, and that reed canarygrass and tall fescue tend to thrive in the wettest fields.

The four forage cropping systems they compared were: 1) corn for silage, 2) mixed legumes, 3) intensively managed grasses, and 4) old stands of grass, largely neglected. All, except for the mixed legumes, were grown on both well drained and poorly drained fields; the mixed legumes were grown only on well

drained areas. Barney and Steward kept records of the costs of fertilizer, seed, lime, pesticides, fuel, labor and other inputs, and of yields, and calculated costs of production, both per acre and per ton of dry matter.

They found that on well drained soils the costs of production were cheapest for the corn silage, at \$52 per ton of dry matter. Inputs per acre were greatest for corn silage, but this was more than justified by the greater yield per acre.

On poorly drained soils, however, production costs proved lowest for the intensively managed grass (\$59 per ton, versus \$65 for the silage corn). Yields per acre of silage corn were sharply lower on poorly drained ground, while yields of intensively managed grass were about the same on either drainage category. Mixed legumes were middling. Input costs per acre were low on the stands of old grass, but yields were so very low that costs per ton were consistently highest of the four systems, no matter the drainage category.

They found reed canarygrass and tall fescue to thrive in the wettest fields, and recommend orchardgrass for somewhat better drained locales. They found canarygrass, tall fescue, and orchardgrass to be highly responsive to nitrogen application, which, to avoid N runoff, should be split applied, at least three applications per year. They also recommend early and frequent cutting. FNE95-78

Aquaculture

Ward Rounsaville, of Norwich, New York, experimented with growing wild rice and minnows in flood and erosion control catchments on his farm. His goal was to see if the catchments could be incorporated as a productive part of the farm.

Rounsaville's land is situated on a fairly steep slope, in the valley of the Chenango

**Vermont poultry
producer and processor
Rob Litch worked with
other Vermont chicken
and turkey producers to
minimize damage to
birds during
transportation to his
processing facility.**

River. This river floods from time to time. Rounsaville has built catchments in the upper part of the drainage to reduce flooding in the bottomlands and diminish gullying on erosion-prone land.

The catchments are effective on Rounsaville's land. Each is fed with seepage and runoff from further upslope. When it rains these catchments fill, then release their contents slowly to the valley below.

Rounsaville acknowledges that in order for this system to be an effective flood-control system, many landowners all along the valley would have to do the same, and it is unlikely without a financial incentive. Therefore he has sown the catchments with wild rice, and put minnows in them, to demonstrate that they can be made productive.

He also grows trout in tanks fed with water from one of the catchments. This water, laden with excreta from the minnows, feeds algal blooms. There are trout in the tanks; they feed on the algae, and receive supplemental meals of minnows as well. The outflow from the tanks is in turn used to water and fertilize a vegetable bed.

The system is quite extensive, and Mr. Rounsaville has been working on it for some years. His SARE grant supported only the expansion of a part of it. FNE96-150

Dairy & Livestock Systems

Stephen McChesney, of Sinclairville, New York, together with Andy DuFresne of Cornell Cooperative Extension, recruited a number of farmers to try out some **record-keeping and financial management software** that Mr. DuFresne had already written for CCE. The participants were shown how to install and use the software, and their suggestions were used to improve the program, and make it more suitable for on-farm use.

The program is called "CropEc," and it may be downloaded, for a fee, from the CCE Chautauqua County website, located at: <http://www.cce.cornell.edu/chautauqua>

Two other programs came out of this project as well, though not in the original plan. One, called "MnureRec," deals with the management of manure, and the other, "MilkFeed Ec," deals with the management of feed for cattle, and milk output, and calculates profitability or loss. These programs are also available at the CCE Chautauqua County website. FNE96-145.

Poultry farmer and processor Rob Litch, of New Haven, Vermont, worked with other **Vermont chicken and turkey producers** to minimize damage to birds during transportation to his processing facility.

Litch found that many birds arrive at his facility dead of suffocation, or with broken legs and wings, due to improper handling and haphazard transportation methods. He addressed this problem by obtaining a number of poultry crates and demonstrating for his suppliers the proper means of packing and transporting the birds, to minimize damage en route. After each use the crates are sterilized, so that they will not serve as vectors of avian disease.

Litch stresses the importance of not using banana boxes, pillow cases, or other makeshift containers, and of not piling the birds unrestrained into a large volume.

Mr. Litch also worked with farmers to improve growing conditions for their poultry, and in particular to reduce the incidence of breast blister, which commonly develops when the litter in which poultry are raised is not kept clean and dry. FNE95-97

Farmer Projects: Reports from the Field

Some of the projects were successful. Others didn't turn out quite the way the farmers had expected.

Farmer Projects: Reports from the Field

Sanford Kelley of Jonesport, Maine, successfully attracted leafcutter bees, an alternative pollinator, to his blueberry field by providing nesting sites for them.

Gregg and Gloria Varney, of Turner, **Maine**, experimented with a system of once-daily milking with their small organic herd. While the practice significantly reduced labor demands, it also, over the course of a year elevated bacterial counts in the milk. The Varney's suggest once-daily milking may be better suited to non-organic production where mastitis can be treated with antibiotics.

The Varney's have both a conventional and organic herd. Their SARE-supported project focused on milking only once a day in their 10-cow organic herd to find out if the labor savings might make up for reduced milk production.

After about a year, the Varney found that the bacterial count in the milk had risen almost to the point where it would not pass inspection, and they discontinued the experiment. During that year, however they realized substantial savings in labor which, they report, more than made up for any lessened production of milk.

They suggest that once-daily is a more feasible option for non-organic dairy cows, since the udder infections that result from less frequent milking may be combated with antibiotics. Once-daily milking may also be an option in organic production for 6- to 12-month periods under extremely hygienic conditions. FNE95-112

Ara Lynn, of New Ipswich, **New Hampshire**, attempted to build **biogas digester** on her **chicken farm** to dispose of manure, and generating heat with which to warm her hatchery. The project was unsuccessful, largely because of multiple leaks in the digester pit, which was lined with concrete blocks (rather than poured concrete), styrofoam insulation and fabric.

Lynn offers the following advice to

others interested in similar projects:

- Choose a site that has easy access for heavy machinery, so that the pit may be properly excavated and prepared;
- Use poured concrete;
- Be sure of the material for the inner liner, that it has a minimum of seams and makes a complete seal;
- Secure the digester cover with stainless steel lag bolts, to avoid corrosion;
- Make sure of a good fit between the liner and the cover;
- Use plastic lumber, because it doesn't shrink and swell.

Fruit

• Sanford Kelley, of Jonesport, **Maine**, successfully attracted leafcutter bees, an alternative pollinator, to his **blueberry** field by providing nesting sites for them.

Blueberries and cranberries require bees for pollination. In Maine it has generally been the practice to lease hives when these crops are in bloom, but this has become quite expensive in recent years, and threatens to become more so as beekeepers grapple with serious infestations of bee mites.

Kelley's project tested ways to encourage the populations of native bees — leafcutter bees and bumble bees — to serve as **alternative pollinators** by building nesting sites. With the help of a high school wood-working class, Kelley built 101 blocks for leafcutter bee nests and 32 houses for bumble bees.

Kelley set the nests around his 50-acre blueberry field, as well as the three-acre cranberry bog of his neighbor. The leafcutter bee blocks were nailed either to 3-foot long stakes, or to trees, about five feet off the ground. Some of the bumble bee houses were set on the ground, and others were buried. They also set out 36 bales of hay, intended either as

bumble bee nesting sites or as hibernation sites for over-wintering queens.

Leafcutter bees came to occupy about a quarter of the blocks, despite some competition from ants, spiders, and other insects. Neither the bee houses nor the bales of hay succeeded in attracting bumble bees.

Kelley is continuing this project for a second year, under another SARE grant. He believes the leafcutter bees will eventually occupy the remaining blocks, as the next generation of queens spawned in the already occupied blocks looks for new nesting sites.

Kelley is also still hopeful of attracting bumble bees too; bumble bees sometimes move into abandoned mouse nests, and the bumble bee houses did succeed in attracting some mice this year. FNE96-138

• Clifford Hatch, of Gill, **Massachusetts**, was able to suppress weeds in **strawberries** through a high-density planting system designed to quickly shade out weeds.

Hatch prepared his seedbed, then flamed the ground with a propane burner to provide as much early weed suppression as possible. He then transplanted four varieties of strawberry plants, at three different densities, using the same spacing of 14 inches between rows on 36 inch centers throughout. Density was varied by varying within-row spacing.

Hatch reported that plots with spacing of 6 inches between plants, which was the shortest within-row spacing with plant density at 28,000 plants per acre, were the most free of weeds in all four varieties. The densest planting rate was also the first to establish a uniform closed canopy; produced the most vigorous growth; was most free of disease; and gave the highest count of fruiting stems per foot of row. FNE95-87

• South Carver, **Massachusetts** **cranberry**

grower Clark Griffith's experiments to boost the productivity of a disease-resistant but generally low-yielding cranberry variety found few benefits from the alternative treatments.

Griffith, with help from researchers at the University of Massachusetts, experimented with four fertilizer programs to examine whether variation from the usual practice as regards quantity, timing, and manner of application could raise the yield levels enough to make Shaw's Success a plausible alternative to the better known, and more disease-susceptible, varieties, such as Early Black, Howes, and Stevens.

Griffith fertilized plots of Shaw's Success with either: 1) four applications of N-P-K fertilizer in granular form (the "traditional" practice); 2) two applications (the second and third) of N-P-K fertilizer in granular form, and two applications of fish emulsion and potassium sulfate; 3) N-P-K as in treatment 1, with an additional foliar application of N and P; or 4) fertilization as in treatment 2, with an additional foliar application of N and P. Chlorothalinol was applied to all plots at early bloom, by chemigation, and a foliar application of Zn was made to all plots at the roughneck stage.

Griffith found few or no treatment effects on the number of berries produced per square foot of bog, on the weight per berry, or on the incidence of fungal disease. Yields were diminished in those treatments receiving the additional foliar application. Highest yields were obtained from treatment 1, the traditional practice; while substitution of fish emulsion and potassium sulfate in treatment 2 did not materially hurt yields, it didn't help them either. FNE94-49

• Deborah Kavakos, of South Cairo, **New York**, began cultivating **lingonberries** as

Farmer Projects: Reports from the Field

Nicholas Maravell, of Potomac, Maryland found that *Bacillus thuringiensis* was the most effective of four biological controls he tested for controlling key insect pests in sweet corn but may not be cost-effective in his situation because of application costs.

way to diversify crop production on her farm. While pest problems have been minimal, she reports the plants are still not well-established and it is difficult to obtain detailed information on obscure crops like the lingonberry.

While seldom grown commercially, lingonberries are native to her part of New York. As an indigenous species, Kavakos had predicted, they might be well-suited to the climate and acid soil of her farm.

Kavakos obtained potted plants and tissue culture plugs of several varieties of lingonberry from a supplier. She planted them and fertilized them with fish emulsion, applied various mulches, and in late fall covered them with evergreen boughs for protection over the winter.

Kavakos reported no pest problems, and says further that the plants did not appear to suffer during a period of drought during their second summer, nor during a period of steady heavy rains that followed. However, three years into the experiment she reports there has been a heavy mortality each winter, only one variety—Red Pearl—has flowered, and she has yet to see any plant bear fruit.

Kavakos says she is left with the impression of having overlooked something, of having neglected some vital element in the cultivation of this species, and she laments how difficult it is to obtain information and advice on obscure crops like the lingonberry. FNE94-55

Vegetables

• Nicholas Maravell, of Potomac, Maryland found that *Bacillus thuringiensis* was the most effective of four biological controls he tested for controlling key insect pests in sweet corn but may not be cost-effective in his situation because of application costs.

Maravell tested four different means of controlling corn borers and earworms: spraying with *Bacillus thuringiensis*; releasing eggs of *Trichogramma pretiosum*, a wasp that parasitizes corn ear worm larvae; providing a hospitable environment for predators of these pests, by intercropping his corn with red clover; and planting his corn in the midst of a field of vetch surrounded by natural vegetation to encourage for beneficials.

Mr. Maravell reports that the *B. thuringiensis* was clearly effective. Twenty percent of the ears in his control plots showed some degree of damage, and another 20 percent were so damaged as to be unmarketable. Treatment with *B. thuringiensis* cut the incidence of damage in half, but with the cost of the bacteria, the special high-clearance spraying rig, and the labor of application factored in, Mr. Maravell says he thinks it was probably not worthwhile.

Maravell reported that the *T. pretiosum* did not appear to be notably effective, although there was not an adequate control for this part of the experiment. Mr. Maravell suspects that most of the individuals he released flew off to parasitize other species than the intended targets.

There were many damaged ears in the field surrounded by vetch, but there were also beneficials and he did observe parasitized corn borers. Again, inadequate control makes it difficult to assess. Maravell advises against procedure because the vetch turns brown and dies in July, and thus is no longer a suitable home for the beneficials by the time the corn reaches the silk stage.

The red clover did not compete successfully with the weeds, so its effectiveness at attracting beneficials remains unresolved. However, Mr. Maravell believes there may still be some promise in this technique. FNE93-12.

Myra Bonhage-Hale, of Alum Bridge, **West Virginia** tested a series of organic, non-destructive methods to prevent deer from eating tomato plants. She found that each of the deterrents worked for a short period of time, and suggests that a system of rotating deterrents might be effective.

The first set of deterrents she tested included a tansy hedge, rose-scented geranium bushes, and blinking Christmas lights around 10 foot by 12 foot plots of organic tomato plants (6 plants in each plot). Deer damage was first noted on each of these plots (including a control plot) eighteen days after installation.

Bonhage-Hale tried additional deterrents, including plastic flats laid around the tomatoes, pink netting saturated with essential oil of rose-scented geranium around a second plot, and mylar strips enclosing a low bamboo fence around the third plot. Deer damage ensued within eight days for the rose-scented geranium oil, nine days for the plastic flat trays, and seven days for the fluttering mylar strips.

Bonhage-Hale then experimented with tent of chickenwire, a web of filament line, and a chickenwire drape. Three plants in the tent of chickenwire were eaten in ten days, while three lived on for a month before being mysteriously devoured; the chickenwire drape worked for fourteen days, and the web lasted fifteen days.

Another experiment, conducted separately, involving a cage canopy with bells, wind chimes, dangling ribbon and raffia was successful.

Bonhage-Hale thinks that most of her deterrents worked for a limited period, but she believes that period grew shorter once the deer had learned that there were vegetables growing in the area. She suggests that the

best way to deal with them would be to rotate among several deterrents, changing them every ten days or so, time and money permitting. She also believes that a system incorporating difficult-to-see barriers and sudden lights, sounds, and motion, particularly motion that mimics the alarmed flick of a deer's tail, and triggered by the movement of the approaching animal, would be worth trying. FNE97-163

• Jeanne Giambrone, of Little Valley, New York, explored methods of starting vegetables earlier in the spring to be able to bring a steady supply of fresh vegetables to her farmers' markets over a longer period.

She purchased seedlings from a greenhouse in March, and transferred them to a cold frame on her farm. Early in April she transplanted them to pots, which she placed out-of-doors, in a protected location. Her hope was that the vegetables would continue to grow there, until the weather was warm enough to permit them to be placed in the ground; she found however that the melons and peppers suffered substantially from the cold.

Besides the cold, the peppers also suffered from an infestation of aphids, which destroyed the eggplants as well.

The tomatoes fared better than the other species, and in late April and early May she placed the surviving tomato plants in the ground. Ms. Giambrone reports that at this point they were already carrying green fruit three to four inches in diameter. Even so, she was not able to harvest any tomatoes from these plants before mid-August, which is about when tomatoes ripen in her area anyway. FNE95-85

Farmer Projects: Reports from the Field

West Virginia vegetable grower Myra Bonhage-Hale, tested a series of organic, non-destructive methods to prevent deer from eating tomato plants. She found that worked for a short period of time, But a system of rotating deterrents might be effective.

1997 Farmer Grant Awards

A group of organic farmers will hold workshops on soil health and mechanical cultivation. The topics were selected because experienced organic growers say they are of high importance to them.

Connecticut

- Michael Berecz, of Woodbury, will test predatory mites and biorational materials to control fungus gnats and western flower thrips in container production systems. His goal is to reduce pesticide use in ornamental production. Grant: \$600. FNE97-162.

- Enfield dairy farmer Jack Collins, along with two adjacent broadleaf tobacco growers, will experiment with composting spent tobacco stalks with corn silage and manure/leaf mixtures using a passive aerated windrow system. The goal is to improve nutrient recycling in accordance with new state aquifer protection regulations. Grant: \$2,042. FNE97-165.

Maine

- R. Stephen Drane, of Auburn, together with the newly formed Maine Ginseng Growers Association, will develop and disseminate educational materials about ginseng production and marketing. The aim is to provide long-term farm income through a non-timber forest product. Grant: \$6,000. FNE97-167.

- Chris Holmes, of Presque Isle, will develop and manufacture packaging to help market high-quality, sustainably produced potatoes for the Aroostook Organic Farmers Cooperative. The packaging will be designed to educate consumers and to allow quick product identification. Grant: \$3,500. FNE97-171.

- Potato farmer Robert Johanson, of Dresden, will test new biological control strategies for Colorado potato beetles that were developed by the University of Maine. The methods include foliar applications of Bt and the fungal pathogen *Beauveria bassiana* and the release of stink bug predators. Johanson's goal is to reduce the use of synthetic pesticides. Grant: \$1,701. FNE97-172.

- Sanford E. Kelley, Jr., of Jonesport, and Robert Hammond, of Harrington, will con-

tinue efforts to promote the growth of bumble bees and alfalfa leafcutter bees, two wild, native pollinators of blueberries and cranberries. Their goal is to develop an effective alternative to renting honey bee colonies, which are increasingly expensive and threatened by disease and parasites. This project continues work funded by SARE in 1996. Grant: \$3,950. FNE97-175.

- Michael McFarlane, of Ellsworth, will continue to investigate potential organic controls for cranberry fruitworm using three different row covers as deterrents. This project continues work funded by SARE in 1996. Grant: \$1,770. FNE97-177.

- Carlton Woodward, of Stonington, will design and build metal racks to hold logs used in small-scale, outdoor shiitake mushroom production. The project aims to improve small-scale mushroom systems by reducing labor requirements. Grant: \$2,225. FNE97-189.

Maryland

- Dairy farmer Darryl Walker, of Damascus, will determine whether an experimental forage—mixing corn, sorghum, sunflowers and peas in the same field then harvesting and storing in “ag bags”—can replace corn silage in the ration. His goal is to reduce purchased inputs, time and storage space. Grant: \$2,230. FNE97-187.

Massachusetts

- Angela Baker, of Charlemont, will determine optimum organic growing conditions for wild Echinacea (*Echinacea augustifolia*) and *Echinacea purpurea* in the Northeast. Her long-term goal is to cultivate and breed superior, non-hybridized cultivars of the medicinal herb that would provide Northeast growers with a high-value, alternative crop. Grant: \$1,730. FNE97-160.

• Doug Coldwell, of S. Deerfield, will evaluate the suitability of June-bearing strawberries in high-tunnel style greenhouses. Coldwell hopes to be able to complete the strawberry harvest in time to renovate the beds and establish a fall crop of tomatoes. Grant: \$2,720. FNE97-164.

• George Kellett, of Amherst, will investigate whether applications of cytokinin-producing bacteria will stimulate lateral branching of *Genovese* basil, thereby reducing the cost- and labor-intensive process of manually pinching off the apical meristem of each plant. The goal is to find a non-toxic, cost-effective method of inducing lateral branching in edible plant species. Grant: \$1,152. FNE97-174.

• Arthur and Rudolph Valonen, of East Longmeadow, will attempt to use trained dogs to keep birds out of blueberry plantings on their pick-your-own farm. The goal is to find a lower-cost, effective alternative to netting, which can cost more than \$3,000 per acre. The Valonens will determine which breed of dog is most suited to this work. Grant: \$2,900. FNE97-184.

New Jersey

• Fred Grasso Jr., of Mullica Hill, will test the use of no-till production in butternut squash to control *Phytophthora* blight. *Phytophthora* is a fungus that causes root diseases responsible for severe crop losses for a broad range of horticultural crop producers in the Northeast. Grant: \$1,680. FNE97-169.

New York

• Richard deGraff, of Pulaski, working with other organic farmers, will organize farmer-oriented workshops on soil health and mechanical cultivation. The workshops are designed to offer continuing education opportunities for established organic growers on sub-

jects that growers say are of high importance to them. Grant: \$3,450. FNE97-166.

• Kurt Kreher, of Clarence, will evaluate alternatives — such as pelletizing or blending to soil test recommendations — for marketing composted poultry manure to farms in need of the nutrients. His goal is to demonstrate to other poultry and livestock producers that composted manure is a value-added product that can successfully compete with commercial fertilizers. Grant: \$5,782. FNE97-176.

• Tony Potenza, of Trumansburg, working with a neighboring farmer, will develop and test a method of interseeding cover crops into organic soybeans at the time of last cultivation as a way to minimize erosion. Potenza aims to develop a practical method for seeding off the cultivator that other farmers can easily adopt, including developing guidelines for seed placement and distribution, seeding rates, machinery design and calibration. Grant: \$5,550. FNE97-179.

• Robert Walker, of Hudson, will test the ability of various bedding materials and amendments to retain nutrients and reduce volatilization of ammonia. Project goals are to explore ways to cost-effectively handle manure, reduce nutrient losses to ground and surface water, and to recycle the manures (through composting) into value-added products. Grant: \$5,080. FNE97-186.

Pennsylvania

• Steve Groff, of Holtwood will explore ways to reduce weed competition and soil erosion in narrow-row corn grown for silage and grain. He will examine the effects of earlier crop canopy closure and the effects root mass and residue production have on erosion. This project continues work Groff began with a 1996 SARE grant. Grant: \$1,495. FNE97-170.

Farmer Grants: 1997 Awards

New York farmer Tony Potenza will develop and test a method of interseeding cover crops into organic soybeans at the time of last cultivation.

Farmer Grants: 1997 Awards

Connecticut farmer Michael Berecz will test predatory mites and biorational materials to control fungus gnats and western flower thrips in container production systems.

Vermont

- Pete Johnson, of Greensboro, will test a sub-surface greenhouse soil heating pipe to convert solar energy into soil heat. The project will evaluate whether it is economically viable to invest in such systems. Johnson's goal is to develop a cold weather system for growing salad greens and other vegetables in the Northeast. Grant: \$4,475. FNE97-173.

- Cynthia Major, of Putney, will provide technical and quality control assistance to a network of sheep farmers who are producing one variety of cheese and marketing it collectively. Through weekly farm visits, the project aims to assist the farmers with cheesemaking methods, provide feedback on cheese quality, coordinate milk and cheese bacteria testing and work with state officials on milk and cheese quality. Grant: \$7,431. FNE97-178.

- Lydia Ratcliff, of Chester, will continue efforts with other small dairy (goat and cow) and fiber producers to promote opportunities for the export of livestock semen. This project continues work supported by SARE in 1996. Grant: \$4,600. FNE97-180.

- Ryan Rich and Emanuel Farrow, of Randolph Center, will determine the viability of raising chickens in movable pens on fields used for organic hay production. Grant: \$5,450. FNE97-181.

- Chris Schlegel and Mary Cockburn, of Glover, will develop a packet of educational materials, aimed at garden centers and consumers, about the cultural requirements of native plants and environmentally sound landscaping practices. Project goals are to provide information needed to successfully relocate these native plants, enhance dependable sources of native plants that are propagated, and reduce pressure on the wild stands. Grant: \$1,145. FNE97-182.

- Judith Sheehan, of Enosburg Falls, will evaluate the feasibility of a unified processing, marketing and distribution cooperative for organically raised meat and poultry in Vermont. Grant: \$3,345. FNE97-183.

- Ken Van Hazinga, of Orwell, will compare six spring wheat and six edible bean varieties in an organic production system as an initial step towards diversifying into these crops. Van Hazinga will also develop full-scale production budgets for both. Project goals include determining which varieties are best suited to organic production in Vermont. Grant: \$6,000. FNE97-185.

- John Williamson, of North Bennington, will continue developing sweet sorghum syrup as an additional cash crop for maple producers. This project continues work supported by previous SARE grants. This year's work includes variety trials, designing a sorghum harvester and evaporation pan, and marketing activities. Grant: \$6,000. FNE97-188.

West Virginia

- Myra Bonhage-Hale, of Alum Bridge, will experiment with alternative deer deterrents — herb plantings around crop plantings and blinking Christmas lights — on her vegetable farm. Her goal is to find a low-cost method of reducing deer damage. Grant: \$937. FNE97-163.

- Bill Grantham, of Kearneysville, will work with other livestock producers to determine the rate of growth and forage quality of their pastures. The farmers, who are transitioning to pasture-based operations, have found that data from similar studies in New York is unusable because of the higher temperatures of the northern Shenandoah Valley. Grant: \$2,753. FNE97-168.

Northeast & National SARE Staff

Fred Magdoff

Regional Coordinator
Hills Building
University of Vermont
Burlington, VT 05405-0082
Phone: 802-656-0471; fax: 802-656-4656
Email: fmagdoff@zoo.uvm.edu

James Gardiner

Program Manager
(address, fax same as Fred Magdoff)
Phone: 802-656-0487
Email: jgardine@zoo.uvm.edu

Beth Holtzman

Communications Specialist
(address, fax same as Fred Magdoff)
Phone: 802-656-0554
Email: bholtzma@zoo.uvm.edu

John Nelson

Financial Records & SAN Distribution
(address, fax same as Fred Magdoff)
Phone: 802-656-0484
Email: jonelson@zoo.uvm.edu

Carol Brier

Administrative Assistant
(address, fax same as Fred Magdoff)
Phone: 802-656-0471
Email: nesare@zoo.uvm.edu

Herb Cole

Professional Development Coordinator
The Pennsylvania State University
218 Buckout Lab
University Park, PA 16802
Phone: 814-863-7235; fax: 814-863-7217
Email: smg1@psu.edu

Shirley Gryczuk

Professional Development Program
Administrative Assistant
218 Buckout Lab
University Park, PA 16802
Phone: 814-863-7235; fax: 814-863-7217
Email: smg1@psu.edu

National SARE Staff

Jill Auburn

SARE Director
US Department of Agriculture
1400 Independence Ave., SW Stop 2223
Washington, D.C. 20250-2223
Phone: 202-720-5384; Fax: 202-720-6071
Email: jauburn@reeusda.gov

Kim Kroll

Associate Director
2121 Ag Life Sciences Surge Building
University of Maryland
College Park, MD 20742
Phone: 301-405-5717; fax: 301-314-7373
Email: kkroll@asrr.arsuda.gov

Valerie Berton

Communications Specialist
(Address, fax same as Kim Kroll, above)
Phone: 301-405-3186
Email: vberton@wam.umd.edu

Andy Clark

Coordinator
Sustainable Agriculture Network (SAN)
AFSIC—10301 Baltimore Ave., Room 304
Beltsville, MD 20705-2351
Phone: 301-504-6425; fax: 301-501-6409
Email: san@nal.usda.gov

Northeast SARE Administrative Council

The Administrative Council, in cooperation with the SARE office at the USDA Cooperative State Research Education and Extension Office (CSREES), sets direction and policy for the Northeast SARE Program.

Council members, who generally serve for three years, are scientists, farmers, educators and administrators of government agencies, non-profit organizations and agricultural businesses. The people listed here served in 1997 and/or 1998, but not all individuals served in both years.

J. Scott Angle

University of Maryland

Elizabeth Henderson

Farmer, New York

Eero Ruuttila

Farmer, New Hampshire

Obie Ashford

USDA-NRCS,
Pennsylvania

Samuel Kaymen

Stoneyfield Farms,
New Hampshire

Lori Sandman

Rodale Institute,
Pennsylvania

Richard Conklin

Farmer, New York

Ron Korcak

USDA-ARS, Maryland

Neill Schaller

Wallace Institute,
Maryland

Robert Dadson

University of Maryland
Eastern Shore

Charles Krueger

Pennsylvania State
University

R. David Smith

Cornell University, New
York

William Doepkens

Farmer, Maryland

Porter Little

Eastern Agribusiness
Division, CoBank,
Massachusetts

Jon Turmel

Vermont Agriculture
Department

Julia Freedgood

American Farmland Trust,
Massachusetts

Sally Merrill

Farmer, Maine

Eric Vowinkle

United States Geological
Survey, N.Y.

Steve Gilman

Farmer, New York

Cass Peterson

Farmer, Pennsylvania

Tim Griffin

University of Maine
Extension

Shanna Ratner

Yellow Wood Associates,
Vermont

Northeast SARE Technical Committee

The Technical Committee reviews grant proposals and advises the administrative council about their merit. The committee includes farmers, researchers, educators, and representatives of non-profit organizations and agribusinesses. Members generally serve for three years. The people listed here served in 1997 and/or 1998, but not all the individuals served both years.

Barton Baker

University of
West Virginia

Michelle Infante

Rutgers Cooperative
Extension, N.J.

Raymond Poincelot

Fairfield University,
Connecticut

Hank Bissell

Farmer, Vermont

Lisa Krall

USDA-NRCS
Maine

Dale Ritchey

USDA/ARS, West Virginia

Jim Boland

USEPA
Washington, D.C.

Laura Lengnick

USDA-ARS
Maryland

Kate Smith

The Pennsylvania State
University

Janet Britt

Farmer
New York

Tom Lyson

Cornell University
New York

Lyle Tabb III

Farmer
West Virginia

Dan Cooley

University of
Massachusetts

Frank Mangan

University of
Massachusetts

Mark Tefteau

University of Maryland
Eastern Shore

Sumner Dole

University of N.H.
Extension

Richard Morse

Cargill Hybrid Seeds,
New York

Arthur Tucker

Delaware State University

Ann Gibbs

Maine Department of
Agriculture

Don Prostek

Rutgers Cooperative
Extension, N.J.

Joanne Whalen

University of Delaware

James Hayes

SUNY Cobleskill

Professional Development Program State Coordinators

Connecticut

Tom Morris
Plant Science Dept.
University of Connecticut
1376 Storrs Rd, Box U67
Storrs, CT 06269
Phone: 860-486-0637

Roy Jeffrey
University of Connecticut
Cooperative Extension
(same address as above)
Phone: 860-486-5428
rjeffrey@canel.cay.uconn.edu

Delaware

Randy Peiffer
Delaware State University
Cooperative Extension
1200 N. DuPont Hwy
Dover, DE 19901-2227
Phone: 301-739-6946

Joanne Whalen
Townsend Hall
University of Delaware
Newark, DE 19717
Phone: 302-831-2526
Joanne.Whalen@mvs.udel.edu

Maine

Tim Griffin
University of Maine
495 College Ave.
Orono, ME 04473
Phone: 207-581-2492
tgriffin@umce.umext.maine.edu

Maryland

Jim Hanson
University of Maryland
Room 2200 Symons Hall
College Park, MD 20742
301-405-1271
jhanson@arec.umd.edu

Marc Teffeau
University of Maryland
Eastern Shore
Cooperative Extension
PO Box 169
Queenstown, MD 21658
Phone: 401-827-8056
kt4@uemail

Massachusetts

Stephen Herbert
Plant & Soil Science Dept.
University of Massachusetts
Bowditch Hall, Box 30910
Amherst, MA 01003-0910
Phone: 413-545-2250
Sherbert@pssci.umass.edu

New Hampshire

Jean Conklin
UNH — 302B James Hall
56 College Road
Durham, NH 03824-3589
Phone: 603-862-4631

New Jersey

Jack Rabin
Rutgers Cooperative
Extension/NJAES
111 Martin Hall
88 Lipman Dr.
New Brunswick, NJ 08901
Phone: 732-932-9395
rabin@aesop.rutgers.edu

New York

R. David Smith
Associate Director, Cornell
Cooperative Extension
274 Roberts Hall
Ithaca, NY 14853-4203
Phone: 607-255-2237
rds4@cornell.edu

Rhode Island

Anthony Malillo
University of Rhode Island
Cooperative Extension
Rodman Hall
Kingston, RI 02881
Phone: 401-874-4658

Pennsylvania

John Ayers
The Pennsylvania State
University
308 Buckhout Lab
University Park, PA 16802
Phone: 814-865-7776
jea@psu.edu

Vermont

Vern Grubinger
Cooperative Extension
University of Vermont
157 Old Guilford Rd.
Brattleboro, VT 05301
802-257-7967
vergn@sover.net

West Virginia

Tom McConnell
West Virginia University
PO Box 6108
Morgantown, WV 26506
Phone: 304-293-5539
tmcconne@wvu.edu

Washington, D.C.

Shaheed Khan
Cooperative Extension
University of the District
of Columbia
4100 Connecticut Ave. NW
Washington, D.C. 20008
Phone: 202-274-6900
jhazel@esusda.gov

Resources

SARE strives to get research results and practical information on sustainable agriculture to those who need it in a timely and useful fashion. Following are resources for information on sustainable agriculture. Northeast SARE project information and accomplishments, calls for proposals, and other information is available on-line at <http://www.uvm.edu/~nesare/>.

SARE Publications and On-Line Materials

To order, contact Northeast SARE. Unless otherwise specified, SARE publications are free.

- *10 Years of SARE*. Case studies of 40 projects from around the country. Limited quantities.
- *Northeast Region SARE Progress Report* 1998 and 1996-97 editions. Limited quantities.
- *National SARE Project Highlights* (1993-1998 editions). Brief and colorful summaries of research across the nation.
- *Exploring Sustainability in Agriculture*. Eight-page brochure.
- *Innovations*, three-times-a-year newsletter of the Northeast Region SARE Program.
- *The Real Dirt: Farmers Tell about Organic and Low Input Practices in the Northeast*. \$13.95.
- *Nutrient Management: More Than an On-Farm Priority*. Eight-page bulletin.

SAN: Publications, Databases, On-Line Materials.

The Sustainable Agriculture Network (SAN) is the outreach arm of the national SARE program. A number of resource publications, handbooks, electronic products and networking opportunities are available. A national database of SARE projects and other information is also on-line via the SAN/SARE Web site at <http://www.sare.org/>. For more information about SAN, contact coordinator Andy Clark at 301-504-6425 or san@nal.usda.gov.

To order SAN publications, send a check or purchase order to Sustainable Agriculture Publications, Hills Building, UVM, Burlington, VT 05405-0082. For information about bulk discounts and rush orders, call 802-656-0471 or email nesare@zoo.uvm.edu.

- *Steel in the Field: A Farmer's Guide to Weed Management Tools*. A farmer-oriented handbook with 45 drawings accenting technical descriptions on tools' roles, designs and costs. Index, contact list, tools source list. \$18.
- *Managing Cover Crops Profitably, Second Edition*. A practical guide to using cover crops to save money, prevent soil erosion and prevent pest problems. \$19.
- *The Source Book of Sustainable Agriculture*. A national guide to 500-plus handbooks, Web sites, newsletters, conference proceedings, bulletins, videos and more. Each entry has a detailed product description and ordering information. \$12.
- *Sustainable Agriculture Directory of Expertise* (print or on computer diskette/Folio software). A list of over 700 people and organizations willing to share their expertise in sustainable agriculture. \$18.95.
- *Profitable Dairy Options: Grazing, Marketing, Nutrient Management*. A brochure on sustainable farming which focuses on rotational grazing, new marketing approaches and some

references for feedlot oriented approaches. Free.

Northeast Publications, Videos, Websites & More

The following resources were developed through Northeast SARE-supported projects. Unless otherwise stated, copies of these resources are available from Northeast SARE and/or the project coordinator. Each listing below includes the title of the resource, the publication in which it appeared if any, contact and ordering information. Unless otherwise specified, materials are free.

Agronomic Crops

"Annual Cover Crops for Maryland Corn Production Systems." Agronomy Mimeo 34. Free.

Write: A. Morris Decker, Agronomy Dept, University of MD, College Park, MD 20742.

Fertilizing Mixed Legume, Grass Pastures, 1993 Edition. Write: Limin Kung, Dept. of Animal and Food Sciences, Townsend Hall 45, University of Delaware, Newark, Delaware 19737.

"Orchardgrass Utilization by Dairy Cattle," in *1997 American Forage and Grassland Council Proceedings*. Jerome H. Cherney, 153 Emerson Hall, Cornell University, Ithaca, NY 14853.

"Rotated Corn Can Enhance Yields with Less Inputs," in *What's Cropping Up*, Vol. 7, No. 2.

Two-page article summarizing benefits achieved from alternative rotations. William Cox, Cornell University 141 Emerson Hall, Ithaca N.Y., 14853.

Sustainable Agriculture Practices for Field Crop Production in the Northeast. Video. \$19.95 +\$3 shipping Write: Resource Center, Cornell Business and Technology Park, Building 7 and 8, Cornell University, Ithaca, NY 14853.

Bees

An Integrated Response to Pollination Problems Resulting from Parasitic Honey-Bee Mites, The Africanized Honey Bee, Honey-Bee Pathogens. Video and companion booklet- \$49.95. Write The A.I. Root Company, P.O. Box 706, Medina, OH 44258-0706.

"Blueberry and Cranberry Pollination: A Comparison of Managed and Native Bee Foraging Behavior," in the *Proceedings of the International Symposium on Pollination*. Obtain photocopies from Connie Stubbs, Dept. of Biological Sciences, 5722 Deering Hall, University of Maine, Orono, ME 04469.

Bulletin on the care, handling, and management of the ALB on wild lowbush blueberry. University of Maine Cooperative Extension. Obtain copies from Connie Stubbs, address above.

Community Agriculture Development

"1997 Community Agriculture Development Resource Notebook," an estimated 500 pages of information relating to community agriculture development in New York. Cornell Farming Alternatives Program, Cornell University, Ithaca, NY 14853-7801.

Community Agriculture Development Packets: "Adding Value with Small Scale Food Processing and Specialty Dairy Products," "Agricultural Economic Development," "Agritourism" "Developing New Markets to Support Local Agriculture," "Engaging the Public in Local Agricultural Issues," "Urban Connections and Community Food Security," and "Who Will Farm? Supporting Farm Families and Farm Workers." All available from: Cornell Farming Alternatives Program, Cornell University, Ithaca, NY 14853-7801.

Proceedings from "Promoting Sustainable Agriculture through a Systems Approach to Consensus Building and Public Policy Education Workshop," January 1997. New Jersey Agricultural Experiment Station Office of Communications.

Community Supported Agriculture

- 1997 Directory of CSA Farms in North America. Obtain copies from Daniel Lass, 236 Draper Hall, University of Massachusetts, Amherst, MA 01003-2040.
- CSA Farm Network, 1996*, by Steve Gilman. Includes materials gathered during the formation of a network linking all CSA farms in the region. \$6. *CSA Network Vol. II, 1997*, includes additional research results and new information. \$8. Write Steve Gilman, CSA Network, 130 Ruckytucks Rd., Stillwater, NY 12170.
- CSA Resource List. Contains scores of publications, internet resources, videos and organizations. Obtain from Daniel Lass, address above.
- "Costs and Returns for CSA Operations in the Northeast, Preliminary Results from the 1996 CSA Survey," Obtain copies from Daniel Lass, address above.
- "Consumer Benefits from Community Supported Agriculture Members," to be published in the *Review of Agricultural Economics*, 1998. Obtain copies from Daniel Lass, address above.
- "What's Your Share Worth? Some Comparisons of CSA Share Cost versus Retail Produce Value," Obtain copies from Daniel Lass address above.

Directories

Farmer to Farmer Directory . \$3.00 for postage and handling. Write: Eric Sideman, MOFGA, P.O. box 2176, Augusta, ME 04338. Phone: 207-622-3118.

Food Processing

- Farming Alternatives Program Newsletter*, publishes articles from time to time about farm-based and other small scale food processing issues. Gil Gillespie, Farming Alternatives Program, Cornell University Ithaca New York 14853.
- "Highlights of the Making it the Northeast: Small-Scale Food Processing Workshop Sessions." Handout summarizes issues and tips shared at the conference. Gil Gillespie, address above.

Livestock Systems — General

- Proceedings from the New England In-Service Training on Sustainable Animal Agriculture*.
- "Beef Cattle, Feeding Broiler Litter, Growing Kenaf on Small Plots." Fact sheet. Write: Cooperative Extension, 910 South Chappall Street, University of Delaware, Newark, Delaware, 19736 Upstairs.

Livestock Systems — Grazing

- Voisin Controlled Grazing Management: A Better Way to Farm*. Video, 33:37 min. \$15.
- Equipment for Maximum Net Forage Production*, Video, 37 min. \$30. Write: Nancy Burgess, college of Agriculture and Life Sciences, Hills Building, University of Vermont, Burlington, Vt 05405. Checks payable to The University of Vermont.

Greener Pastures on Your Side of the Fence, by William Murphy. Write: Nancy Burgess, college of Agriculture and Life Sciences, Hills Building, University of Vermont, Burlington, Vt 05405. Checks payable to The University of Vermont.

Livestock Systems — Manure & Nutrient Management

“Getting a Manure Sample,” a University of Maine Cooperative Extension fact sheet, (Bulletin 2428). Write: Tim Griffin. University of Maine, 495 College Ave., Orono, ME 04473-1294.

“Improving Nutrient Management on 100 Cow Free Stall Dairy Farm,” Miner Institute Farm Report. Write: Miner Institute, P.O. Box 90, Chazy NY 12921.

“Manure: What its Worth on Your Farm?” handout. Tim Griffin. University of Maine, 495 College Ave., Orono, ME 04473-1294.

“Understanding A Manure Sample,” a University of Maine Cooperative Extension Fact Sheet, (Bulletin 2429). Tim Griffin. University of Maine, 495 College Ave., Orono, ME 04473-1294.

Water Pollution, Agriculture Conference: What Farmers Need to Know about Water Pollution proceedings. Approximately 200 pages on ways to reduce non-point water pollution, manage nutrients, applicable laws and regulations, etc. Sponsored by the Maine Farm Bureau. Tim Griffin Tim Griffin. University of Maine, 495 College Ave., Orono, ME 04473-1294.

K-12 Curricula

Compost Laboratory: Guideliness and Lessons for Studying Composting in the Classroom, a teacher's guide to lesson plans and hands-on activities for studying composting in school curricula. Available in late 1998 from Woods End Research Laboratory, Old Rome Road, Rte. 2, Box 1850, Mt. Vernon, ME 04352.

Resource Conservation and Environmental Stewardship in the Md. Ag. in the Classroom Agriculture Education Sourcebook briefly describes activities, lesson plans, and curriculum catalogues. Pickering Creek Environmental Center, 11450 Audubon Lane, Easton, MD 21601.

On-Farm Research

On-Farm Demonstrations 1996, booklet, Pennsylvania State University, Blair and Huntingdon Counties, PO Box 449, Highland Hall Annex, Hollidaysburg, PA 16648-0449.

Ornamentals

“Integrated Plastic Management,” in *Greenhouse Insider*.

The Sustainable Plant List-Sustainable Trees And Shrubs for Southern New England- 2nd Edition. 1995. \$4. Write: Cooperative Extension, U.S. Dept of Agriculture, The University of Rhode Island, Kingston, RI 02881-0804, also on World Wide Web.

“So Much to Do . . . So Little Time,” article about greenhouse IPM appeared in horticultural newsletters in New Hampshire and Vermont.

Potatoes

“New Products for Colorado Potato Beetle Management,” in *Spudlines*, a University of Maine Cooperative Extension publication. One-page summary of alternatives to chemical manage-

ment. Kathleen Murray, University of Maine, Deering Hall, Orono, ME 04469.

Sustainable Alternative Management Techniques for the Colorado Potato Beetle. Video. Focuses on trench traps (8 min) and propane flaming (8 min.) \$15. Cornell Cooperative Extension, 246 Griffing Ave, Riverhead, NY 1190. Phone: 516-727-7850.

Integrated Pest Management Guide in Potatoes—March 1995. Write: Publication Distribution Center, College of Agricultural Sciences, Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802-2602. Phone: 814-865-6713.

The Ecology, Economics and Management of Potato Cropping Systems: A Report of the First Four Years of the Maine Potato Ecosystem Project. Maine Agricultural and Forest Experiment Station, University of Maine, 5782 Winslow Hall, Orono, Maine, 04469-5782.

Small Fruit — General

Small Fruit Production and Pest Management Guide, 1996-98. \$10. Check or money order , Write to: Publication Distribution Center, College of Agricultural Sciences, Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802-2602. Phone: 814-865-6713. Checks payable to The University of Pennsylvania.

Small Fruit — Blueberries & Cranberries

University of Massachusetts Cranberry Station Newsletter covers topics such as winter flood management, and IPM approaches to pest management. Available from UMASS Extension, Amherst Mass, 01003-0099.

“Blueberry and Cranberry Pollination: A Comparison of Managed and Native Bee Foraging Behavior,” in the *Proceedings of the International Symposium on Pollination*. Obtain photocopies from Connie Stubbs, Dept. of Biological Sciences, 5722 Deering Hall, University of Maine, Orono, ME 04469.

Bulletin on the care, handling, and management of the ALB on wild lowbush blueberry, published by University of Maine Cooperative Extension. Obtain photocopies from Connie Stubbs, Dept. of Biological Sciences, 5722 Deering Hall, Univ. of Maine, Orono, ME 04469.

Small-Fruit - Grapes

Organic Grape and Wine Symposium. Proceedings. Robert M. Pool, NY State Experiment Station, Cornell University. \$10.00 add \$3.00 for postage Write: Bulletins, Jordan Hall, New York State Agricultural Experiment Station, Geneva, NY 14456.

Small Fruit — Strawberries

Integrated Pest Management for Strawberries in the Northeastern United States: A Manual for Growers and Scouts. A University of Mass. Coop Ext. publication. \$7 Write to: Bulletin Center, Draper Hall, University of Massachusetts, Amherst, MA 01003. Phone: 413-545-2717.

“Proper Plant Type, Planting Date and Double Cropping Optimize Profitability of the Strawberry Plasticulture System,” abstract in *The County Agent*. Joseph Fiola, Rutgers University Fruit R&E Center, 283 Route 539, Cream Ridge, NJ 08514.

“Cool Climate Strawberries Fare Well on Plastic,” in *American Fruit Grower*, 1997. Joseph

Fiola, Rutgers University Fruit R&E Center, 283 Route 539, Cream Ridge, NJ 08514.
"Update on the Strawberry Plasticulture System," in *Hort News* 77(4). Joseph Fiola, address above.
"Strawberry Plasticulture Considerations for Colder Production Areas," "Strawberry Plasticulture in Maryland," and "Strawberry Cultivar Selection," all in the *Proceedings of the 1997 South-east Strawberry Expo*, available for \$10 from NC Strawberry Association, 1138 Pittsboro, NC 27312. ncstrawberry@mindspring.com.

Soil Quality

"MD Researchers Attempt Soil Quality 'Index,'" in the Winter 1997 issue of the *Future Harvest Newsletter*. Ray Weil, University of Maryland Department of Agronomy, H.J. Patterson Hall, College Park, MD 20742.

Tree Fruit

Management Guide for Sustainable Apple Production, \$12 from Nancy Burgess, College of Agriculture and Life Sciences, Hills Building, UVM Burlington, Vt 05405. Checks payable to The University of Vermont.
1996-97 New England Apple Pest Management Guide. \$8.50 from Nancy Burgess, College of Agriculture and Life Sciences, Hills Building, University of Vermont, Burlington, Vt 05405. Checks payable to The University of Vermont.
Virtual Orchard, <http://www.uvm.edu>. Website.

Urban-Farm Connections

Proceedings from the New Connections in the Northeast Food System Conference, March 1997.
Available for \$20 from Hartford Food System, 509 Weathersfield Ave, Hartford, CT 06115.
"Learning the ABCs of Healthy Eating," a handout of the Hartford Public Schools, March 1997.
Guides to purchasing locally grown produce for food service staff and marketing to institutions for farmers. Available from the Hartford Food System, address above.

Vegetables — General

Alternative Rotation System for Vegetable Production and Soil Conservation, published report being distributed by A.S.C.S. office on regional basis Allen G. Matthews, Farmers Alternative Resource and Marketing Corp., PO Box 84, scenery Hill PA 15360. "Mechanic in-row cultivation in Row Crops," by J. Ascard and Robin Bellinder. Second International Weed Control Congress, Copenhagen.
New Cultivation Tools for Mechanical Weed Control in Vegetables. Bulletin. Cornell University Media Services Resource Center, 7 Cornell business & Technology Park, Ithaca, NY 14850.
New Tools for Mechanical Weed Control. 12-minute video. Contact: Robin Bellinder, Department of Fruit and Vegetable Science, 164 Plant Science Building, Ithaca, NY 14853. Phone: 607-255-7980.
Northeast Cover Crop Handbook. \$4.00, (PA residents add 6% sales tax.) *Northeast Cover Crop Fact Sheets*. \$6. Write: Rodale Institute Research Publications, 611 Siegfriedale RD.,

Kutztown, PA 19530.

“Summer Cover Crops for the Capital District,” by Dale Riggs, in *Capital Vegetable News*, March 1997.

Vegetable and Small Fruit Integrated Crop & Pest Management Program 1996 & 1997 Annual Reports. Ruth Hazard, University of Massachusetts Agroecology Program, PO Box 30210, Amherst MA 01003-0210.

Vegetable Farmers and Their Weed Control Machines. Video, approx. 40 min. \$10 from the UVM Center for Sustainable Agriculture, 590 Main Street, Burlington, Vermont, 05405. From sweeps and rotary hoes to flame weeders and home-made tools, this 75-minute video shows the the diversity of cultivation tools available and explains the weed controls strategies being effectively used by New England vegetable farmers.

Website on Alternative Vegetable Production Systems: <http://Azalea.lscpe.psu.edu/>

Vegetables — Cabbage

“Plant Nutrient Uptake in Cabbage,” in *New Jersey Grower*, 19:3-4 1996.

Vegetables — Sweet Corn

Articles and fact sheets about Presidedress Soil Nitrate Testing in Sweet Corn and other vegetables. Richard Ashley, Dept of Plant Science, University of CT, Storrs, CT 06269-4067.

“Bacillus Thuringiensis Products for Early Season European Corn Borer Control,” in *Grower*, the Vol. 95-5. Ruth Hazard, address above.

Biointensive Sweet Corn ICM Project Final Report, Vegetable & Small Fruit ICM Program, University of Massachusetts, publication C-220. Ruth Hazard, address above.

“On-Farm Trials of Bacillus Thuringiensis Products for European Corn Borer Control,” in *Grower*, Vol. 97-4. Ruth Hazard, address above.

“On-Farm Trials of Bacillus thuringiensis (Bt) Products for European Corn Borer Control: Year Two Report.” Two page handout. Ruth Hazard, address above.

“Nitrogen Recommendations for Corn Using Presidedress Soil Nitrogen Test,” FS # 569. Write Publications Distribution Center, Cook College, Rutgers University, P.O Box 231, New Brunswick, NJ 08903.

“Soil Testing To Manage Nitrogen for Sweet Corn,” University of Conn. Cooperative Extension FS 95-1. Write: Agricultural Publications Dept., University of Conn. Storrs, CT 06269-4035.

Vegetables — Tomatoes

New Jersey SARE Tomato Homepage at <http://www.orchard.uvm.edu/tomato/default.html>

Editor’s note: Did we miss your product? Please let us know. SARE staff used information from project reports to assemble as complete as possible list of SARE-supported resources that were available in early 1998. It’s possible, though, that we inadvertently missed a few. If your materials were not included in the list, or if you’ve recently completed a publication, video or other information resource, please let us know and we’ll include it in the next publication of this list. We’ll also and may list it in the resources section of our newsletter.

Northeast SARE Active Projects in 1997

Editor's note: The following projects were active in 1997. Projects with an asterisk () after the number submitted a report in 1997 and are included in this document.*

Agronomic Systems

- ANE92.8 * Development of Sustainable Cropping Systems for New York Cash Crop Producers
- ANE92.10 * Farmer-to-Farmer Compost Exchange
- ANE95.27 * Utilization of a Neem Product in a Reduced Synthetic Insecticide Program for Colorado Potato Beetle
- ANE96.30 * Biorational Management Program for Potato Pests
- LNE94-42 * Optimizing Use of Grass on Dairy Farms for Environmental & Economic Sustainability
- LNE96-69 * Soil Test for Active Organic Matter
- LNE96-75 * Northeast Kingdom Nutrient Management Project
- LNE97-87 * Managed Riparian Buffer Zones & Cover Crops to Minimize Phosphorus & Nitrogen Runoff Losses from Corn Fields
- LNE97-91 * Demonstration of Narrow Row Corn Production in New York
- LNE97-93 * Sustainable Phosphorus Fertilizer Recommendations for Corn Production in the Northeast US
- LNE97-96 * Eastern Gamagrass: Determining its Feasibility as a Forage Crop for the Northeast

Bees

- LNE96-66 A Study to Evaluate Heat Treatment for Honey Bees

Forestry & Biodiversity

- LNE93-37 Integrating Stewardship Forestry into Total Farm Management
- LNE96-78 Seed Saving and Biodiversity

Dairy/Livestock Systems

- ANE94.20 * Nutrient Management on Maine Dairy Farms
- LNE95-52 * Managing Dairy Waste Using Constructed Wetlands and Composting Andy Baldwin
- LNE95-52 * Fescue Endophyte Research Study
- LNE95-54 * Expanding Profits for Sheep Production through Intensive Pasture Management
- LNE97-86 * Efficacy Evaluation of Homeopathic Nosodes for Mastitis & Calf Scours, & Documentation of Homeopathic Practices in Organic & Conventional Dairy Production
- LNE97-89 * Farmer-Centered, Value Added Processing & Marketing Opportunities for Northeast Dairy Farmers: A Participatory Research and Development Project
- LNE93-39 * A Systems Analysis of Organic and Transitional Dairy Production
- LNE94-45 Increasing the Sustainability of Dairy Farms by Improving Persistence of White Clover in Pastures
- LNE95-55 Control of Gastrointestinal Nematodes in Dairy Cattle under Intensive Rotation Grazing Management

Education

- LNE94-48 Conservation of Water at Woodvale Farm
- LNE95-61 * Resource Conservation and Environmental Stewardship in the Maryland Ag in the Classroom Curriculum Guide
- LNE96-71 * Compost Laboratory Education Project

-
- LNE96-76 * Outreach and Training for On-Farm Composting
 - LNE96-79 * New England Sustainable Agriculture Conference 1997
 - LNE97-84 * Design and Implementation of a Searchable Database on Compost Production and Use for Internet Users

Fruit Systems

- ANE95-24 * Biopesticidal Strategies for Insect Management in Cranberry
- ANE95-25 * Toward Biotoxicant Management of Key Summer Apple Pests
- LNE88-01 * Development of a Sustainable Apple Production System for the Northeast
- LNE94-46 * Improving Pollination for the Northeast: On-Farm Testing, Demonstration, and Management of the Alfalfa Leafcutting Bee
- LNE94-50 * Water Management to Minimize Pesticide Inputs in Cranberry Production
- LNE95-57 * Improving the Profitability and Adaptation of a High Density Strawberry Production
- LNE96-64 * Impact of Herbicides on Beneficial Insects of Blueberry and Cranberry
- LNE96-72 * Sustaining Grape Production in the Northeast Through Farm-Tested Information Technologies
- LNE96-74 * Peach Orchard Ground Cover Management to Reduce Arthropod Damage
- LNE97-80 * A Strawberry IPM Systems Comparison Demonstration
- LNE97-81 * Potential of Earthworms as Bio-control Agents of Scab and Leafminers in New England Apple Orchards
- LNE97-85 * Integration of Behavioral, Biological, and Reduced-Risk Chemical Approaches into a Sustainable Insect Management Program for Cranberries
- LNE97-90 * Integrating High-Density Orchards and Biointensive Integrated Pest Management Methods

Marketing

- LNE95-60 * Commercial Small-Scale Food Processing in New York: Value-Adding for Sustainable Agriculture
- LNE95-63 * Community Supported Agriculture: Research and Education for Enhanced Potential in the Northeast
- LNE97-88 * CORE Values Northeast: A Northeast IPM-Apple Consumer Education & Market Development Project
- LNE97-94 * Ethnic Markets & Sustainable Agriculture

Ornamentals

- LNE95-58 * Development of Fungal Entomopathogens for Greenhouse IPM
- LNE96-70 * Enhancement of Sustainable Pest Management Techniques Through Banker Plants and Colored Mulches
- LNE97-95 * Flowering Plants to Enhance Biological Control in Landscapes
- LNE97-92 * Chinese Medicinal Herbs and Crops for the Northeast

Professional Development

- ENE95-07 * Information Management Training
- ENE95-08 * New England Extension Sustainable Agriculture Training Program
- ENE95-10 * Education of Extension Workers in Sustainable Agricultural Practices Utilizing the PASA Conference and Farm Visits
- ENE95-11 * On Farm Research and Extension Education Program
- ENE95-12 * Farming for the Future
- ENE95-13 * Whole Farm/Whole Watershed Planning
- ENE96-15 * Farmer-to-Farmer Learning Groups: Curriculum for Establishment and Facilitation

ENE96-16 *	A Diagnostic Team Approach to Enhancing Dairy Farm Sustainability
ENE96-17	Teaching to Achieve Sustainable Management of Phytophthora Diseases on Horticultural Crops
ENE96-18	Development of Dairy Farm Management Groups in Vermont and New Hampshire
ENE96-20 *	Holistic Resource Management: Eastern New York Pilot Program
ENE96-21 *	Regionally Based Professional Development Program for Grazing Systems Management
ENE96-22 *	Video Training on Improving Water Quality in the German Branch Watershed
ENE96-24 *	Training, Networking and Demonstrating Whole-Farm Forage Grazing Systems
ENE96-26 *	Management and Evaluation of Soil Health: Inservice Education for the Mid-Atlantic
ENE96-27 *	In-Service Training on Sustainable Agriculture
ENE97-28 *	Developing and Publishing Sustainable Agriculture Resources for Agricultural Extension Professionals
ENE97-29 *	University of Maine Cooperative Extension Compost School
ENE97-30 *	A Video of Innovations in On-Farm Marketing in New England
ENE97-32 *	The Farmer's Relevant Voice: A Farmer-Produced Educational Program for Watershed Coordinators
ENE97-33 *	Riparian Buffer Training
ENE97-34 *	Building a Future for Farming in the Northeast
ENE97-35 *	A Comprehensive Training in Sustainable Agriculture
ENE97-36 *	Review & Evaluation Materials Pertaining to Nutrient Management & Soil Health
LNE97-31 *	Multi-Media Aids & In-Service Training Program for Using Insecticidal Nematodes
ENE96-23	Communication and Outreach for Sustainable Agriculture: A Video Training Program for Extension
ENE96-25	Cooperating for Sustainability: A Training Program on Cooperatives and Value-Added Marketing

Urban-Farm Connections

LNE96-65 *	Farm to School Education Project
LNE96-68 *	Farming for the City Conference
LNE96-77	Sea Change Urban Horticultural Center: Sustainable Agriculture Initiatives

Vegetable Systems

ANE94.19	Presidedress Soil Nitrate Testing for Sweet Corn
ANE95.22 *	Developing Sustainable Management Tactics for Cucumber Beetles in Cucurbit
ANE95.26 *	Integrating Microbial Insecticides and Oils into Sweet Corn IPM
ANE96.30 *	Working Towards Implementation of a Disease Forecasting System for Fresh Tomatoes in New Jersey
LNE92-32 *	A Living Laboratory for of Research and Education Efforts on Alternative Vegetable Production Systems
LNE93-35 *	Developing Crop Rotational Budgets for Three Cropping Systems in the Northeast
LNE94-40 *	Integrating New Cultivation Technology and Photocontrol of Weeds to Reduce Herbicide Use in Vegetables
LNE94-43 *	Use of Rhizosphere Competent Fungi as an Alternative to Soil Fungicide
LNE94-44 *	Management Strategies for Improved Soil Quality with Emphasis on Soil Compaction
LNE95-56 *	Presidedress Soil Nitrate Test for Fall Cabbage
LNE95-59 *	Implementation of a Disease Forecasting System for Tomatoes in Northern New Jersey
LNE96-67 *	Demonstrations of Sustainable Vegetable Pest and Crop Management: Fresh Market Sweet Corn
LNE96-73 *	At Harvest Stalk Nitrate Testing for Sweet Corn
LNE97-82 *	Biological and Cultural Methods of Insect Management in Vegetables
LNE97-83 *	Nitrogen Management for Pumpkins and Squash

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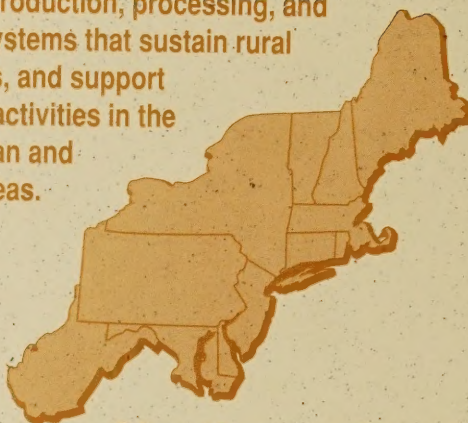
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Phone: 802-656-0471 • Fax: 802-656-4656

Email: nesare@zoo.uvm.edu

<http://www.uvm.edu/~nesare/>